DRAFT WATER RESOURCES (JERSEY) LAW 200-

TRANSCRIPT OF EVIDENCE
PROVIDED TO THE VIBERT SCRUTINY PANEL
BY
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SENATOR LE MAISTRE: I think we will take the statement as read, Dr Sutton. You've heard it read a number of times. But, for the record, I need to refer to it and ask you

whether you're aware of its contents?

DR SUTTON: I am, yes.

SENATOR LE MAISTRE: Thank you very much. First of all, thank you very much for the time you've already spent with us and for the submissions that you have indeed made and the comments on some of the submissions. I think it's right that we should have this opportunity. We may need to continue it later on but we'll use this slot to benefit from your presence and I'd like to simply open to Members of the Panel to ask questions. Deputy Baudains?

1. Argument that the aquifer is stressed no longer tenable

DEPUTY BAUDAINS: Thank you. It seems to me that the question of stress - whether or not the aquifer is under stress - goes, or in fact the Law, goes back to the **Riley Report** when it was assumed that the water was under stress, but we have heard varying information that it is under stress; it is not under stress. As I understand it the initial information which the working party on water claimed derived from what we know as the Riley Report was based essentially and it's been overtaken by fresh evidence and the argument that Jersey's aquifer is stressed is no longer tenable. What is your view?

DR SUTTON: Well, reading the written evidence submitted to the Committee by the BGS, and it is solely from reading that evidence - I have not worked directly in Jersey - up to about 1996 the tone of all of the reports were that it was of a resource that was on the verge of collapse - that it was absolutely imperative that something be done. And that resource was calculated on a figure that said 50mm per year of the rain infiltrated to the ground and effectively all of that was used by the requirement to maintain base flows in streams in summers and by abstraction, so that every drop of water that infiltrated to the ground in an average year was fully used.

2 Trinity Catchment Study

Then in 1996 the Trinity Catchment Study was carried out and the results were published in the 1998 Jersey Groundwater Study. The Trinity Catchment Study seems to have been a very comprehensive piece of work with large numbers of rain gauges and measurements of stream flows and measurements of groundwater levels; and arising from that the Institute of Hydrology, as they were called then - they're now called the Centre for Ecology and Hydrology in Britain - calculated that the average amount o recharge -- average amount of rainfall that went to recharge was 132mm.

Effectively, year on year the average resource increased from 50 to 132 and on that basis it was calculated that about 30mm was required to support the

calculated 3.5 million cubic metres of groundwater abstraction. About 30mm was necessary to maintain base flowing streams and so there was about 50% that, in general terms and I believe presently in the UK, that the use of 50% of the average resource is considered to be a **moderate level of stress**. It is not a stress-free existence but, in parallel with that, the BGS have annually reported the results of monitoring of groundwater quality, in particular nitrate levels and representative pesticides since about 1990 and groundwater levels since about 1993, and looking at those there is **no evidence of increasing stress through that period**.

Groundwater levels have not been falling. If you even go to the 1996, which the BGS themselves labelled a very dry year and calculated that the recharge for 1996 was 25mm rather than the average of 132, groundwater levels as reported in the BGS report for 2001/2002 and they report the annual variation in water levels were perhaps 30 or 40cm lower in some of the monitoring boreholes at the end of the summer of 1996, but they recovered rapidly through the winter. So, there are no records before 1990 - I cannot speak of the situation before then - but through to 1990s there is no evidence of increasing stress and indeed **the tone of the BGS reports changes from the revival of a resource on the verge of collapse to the understanding of a resource which is, as yet, poorly understood.**

3. Saline intrusion

DEPUTY BAUDAINS: Coupled with that, when I read the reports I was somewhat confused because on some pages it says that there is saline intrusion caused by over-abstraction and other pages it says there's no evidence of saline intrusion. From your reading of the reports and your understanding, what is your opinion?

DR SUTTON: Well, the one place that it seems unequivocal that there is saline intrusion is there's a small area of sand from which groundwater is abstracted behind **Grouville** - that there is definitely saline -- some saline water coming into that very local area of sands there.

For -and you have to forgive the Irish pronunciation of **St Ouen's** - it may be totally in error. But for the sand aquifer on the west side of the island, the evidence is to me equivocal. The Jersey Groundwater Study says that the shape of the sand aquifer is such that is -- because there is a rock ledge it is not possible that salt water could be drawn in.

You might dry it out by taking out all the fresh water but we were told unequivocally by Dr Peach of the BGS last week that there was evidence of saline intrusion there. That evidence hasn't been presented in writing but I think we would accept - we have no choice but to accept and that there is clear

evidence of some stress, perhaps above an acceptable level in those two bodies of sand.

4 Area of water scarcity

SENATOR LE MAISTRE: Deputy Rondel?

DEPUTY RONDEL: Yes. This morning Members were told that Jersey found itself in the top 11 or in 11th place out of 149 countries where we have -- where water scarcity and, given our geographical position between France and - well, two areas of France and the United Kingdom who in fact have a very high water table and an abundance of water - would you consider that we sit in a place like between Jordan and the Yemen for actually a shortage of water?

DR SUTTON: Long time since I've worked in the Yemen but I think those figures have got to be looked at in perspective. Jersey is a small compact area and the population is dense and is distributed fairly evenly across the whole area.

If you go to the United Kingdom there are large areas in which there is very little population; there's very little use made of water. The rainfall that falls on large areas of the Scottish Highlands may be used to generate the odd bit of hydropower, but it's not available to those that live in the sort of more congested conditions inside the M25; and if you looked at areas of comparable size I don't think Jersey is any worse off than East Anglia.

I've no figures to prove it but I would suspect if you looked at England on a county by county basis, there are counties which are - and a county is broadly similar in size to Jersey - there are counties where the situation is perhaps worse than Jersey. But there are certainly counties with very low populations and very dispersed and sparse populations and when the situation is reduced to those numbers, the situation would appear to be a lot better.

But I think those numbers would have to be taken into -- put into perspective in terms of the availability of that water to people. One notable point there, I think it says Libya has twice as much water as Jersey, but I would think 95% of the rain in Libya falls on areas where nobody lives and evaporates as soon as it falls and without seeing the basis of the calculation I wouldn't like to say any more.

DEPUTY RONDEL: Thank you.

5 Co-operation instead of regulation

SENATOR LE MAISTRE: Senator Vibert?

SENATOR VIBERT: The difficulty I think that the Panel has at the moment is that we have evidence being presented to us that this Law is absolutely necessary to protect an endangered position and in fact the water resource in the whole table is

reducing and it's under threat and the Committee rightly, if that's the case, wishes to take steps to make sure that that doesn't get any worse and also to control it and to obtain the necessary information for constant monitoring of it. That's my understanding of the reason for the Law.

But I'd like to put it to you in the light of all the evidence that you have looked at and seen, do you think a law of this kind and of this magnitude is actually necessary?

DR SUTTON: The average Irish answer to any question that says is a law necessary is probably no; and I think in this particular case I think we're dealing with a small area with a population that is firmly rooted within the area and I think the way to - and this totally a personal opinion - but the way to move towards proper conservation of resources is **not by regulation but is perhaps by co-operation**.

But the first inclination, if you look at the data that's presented and this is the data in front of the Committee and the latest BGS report which is Jersey Groundwater 2002, with the possible exceptions of the sands that we talked about earlier, there is **no evidence of increasing nitrate levels in groundwater**. In fact, they may be falling slowly or may have fallen some by 5 or 10% since 1990 and there is certainly **no evidence of declining groundwater levels** in the bulk of the rock aquifer of Jersey.

I'm not a lawyer so I'm not qualified to comment on the actual applicability of the Law, but I would have thought that it wasn't beyond the wit of man to conserve groundwater in a less draconian way.

6 No immediate threat to Island's water supply

SENATOR VIBERT: Sir, can I put the question in a simpler way to you? We are being told that this is almost an emergency situation. The President of the Environment said this morning that decisions on this had to be made immediately because there was a real threat to our water table. Do you think that that threat exists at the level that's been put to us?

DR SUTTON: Not from the evidence that was presented in writing to the Committee.

7 Lack of knowledge of groundwater at deeper levels

SENATOR LE MAISTRE: Could I just ask: there is an issue which we heard presented about the difference of the water in the upper level, the first 20 - 30 metres and the fact that there was not a lot of information of water below that. Would you think that this is a significant omission at this stage or would you consider, with the geology of Jersey, that that is not an area that is likely to provide significant water supply? I mean we have to yet hear the well drillers I know but it is an

issue I think at the moment as we try to sift out the information which is coming forward.

DR SUTTON: I think it's certainly an issue and it's an issue that isn't well understood and it's an issue we were told specifically last week had not been investigated by the British Geological Survey. There is evidence presented in writing to the Committee of a -- sorry, if I could just go back one step, the conceptual model on which the British Geological Survey calculate the water resource is based on a relatively thin fractured upper levels of the rock where the fracturing has been induced by relief of pressure in atmospheric processes and once you get below 25, 30 to 35, 40 metres the fissures are effectively tight and no more water can move through.

The evidence that we heard from the last (several inaudible words) speaker or witness is the appropriate word - the last presenter of evidence was there are if you get down 200 or 300 feet there are substantial numbers of wells producing water. The evidence in the written evidence submitted by the water diviners and well drillers again suggest between 200, 300, 400 feet.

And geologically Jersey is part of neighbouring France; it is part of the same faulted and fractured regime and I think experience in similar terrain across the world would suggest that yes, there could be and it's controlled by fracturing and fissuring and is very, very difficult to quantify which is not an unrealistic assumption.

8 Groundwater link with France

DEPUTY RONDEL: -- can I come in? You mention France and that's one of the areas I was just going to ask you about. From what I'm understanding, there is a possibility that we could be getting some of our water from the Continent of France, given that we're only 14 miles away from France?

DR SUTTON: Given that we're only 14 miles away and Jersey is effectively on the Continental Shelf of the Cherbourg Peninsula, that the age of the rocks and the origenic(?) events, the geological cataclysms which have formed and shaped them are the same as those that have formed and shaped the Cherbourg Peninsula and the nearby bit of France, certainly the structure - the geological structure - and the faulting and the folding is cohesive between the two: **It is not unrealistic to say that there is the possibility that there is water movement between the two.**

13 or 14 miles is a relatively short distance, given the amount of time that's available to groundwater to move.

DEPUTY BAUDAINS: When you say it's a relatively short distance, are you able to tell us if - and of course it's a very big if because no research has been done - if water did come to us from France, how long would it take to get here because I remember asking the question of BGS some time ago and I was given the impression it

would be hundreds or thousands of years.

DR SUTTON: I would have certainly thought you were looking at hundreds. The gradients are relatively low, groundwater moves at metres per year rather than metres per day. We would be looking at tens to hundreds of years -- but once water gets into fractures it can move -- people say groundwater moves very slowly. It moves very slowly through sands because it's moving through minute pores between small grains. If there are major faults or fractures or fissures, tens or twenties of years might not be unrealistic, but it may well be hundreds.

9 Raising licence exemption limit from three cubic metres

SENATOR VIBERT: Mr Chairman, if I may change the subject slightly and go back to the three cubic metres that we've been discussing this morning. As we've heard from the previous witnesses as far as their industry is concerned, they would far prefer to see it lifted to **ten cubic metres** per day. I wondered if you could give us any indication as to whether you think that would be a more reasonable threshold than the three cubic metres.

DR SUTTON: Well, I've read the BGS report which I think is their report for 2001 or -- sorry, it's their report for the year 2000, which is where the -- they recommend the two cubic metres per day, which we heard had recently been upped to 3 and I think it's reasonably clear from that recommendation that the two cubic metres a day recommendation was brought forward to obtain a reliable measurement or a view of the quantities abstracted rather than to prevent derogation of other sources.

The BGS themselves describe the bedrock aquifer of Jersey as complex and unpredictable and impossible to define the capture zones of sources. If you look at equivalent sort of fractured rock aquifers in the UK or in Ireland, they are unpredictable.

Generally speaking, a rate at three cubic metres a day, which is ½ a gallon a minute which is very small, is not something that's going to give rise to derogation of nearby sources and the protection, I would feel, has got to be a major argument for regulation and I think to set a level of protection below that which derogation of existing sources is reasonably possible unless they're sort of within ½ a metre of each other will lead to a lot of -- generate a lot of paperwork, a lot of ...

Once you license, you must assume that sometimes you're going to deny licences, that the whole process will be very large and I don't know -- **I can't see from a protection point of view a reason of moving away from the ten cubic metres a day that was set in the United Kingdom under the 1963 Water Resources Act when there was also the provision for licence**

exempt areas and which will now become 20 cubic metres a day when licence exempt areas are no longer sustainable when the 2003 Water Bill becomes law.

SENATOR VIBERT: Do I take it from that answer that you take the view that the reason three cubic metres has been chosen is not to protect the source but in fact to enable the widest net possible, within reason, to be cast so that there is x number of boreholes that will be included to give them the survey information they're looking for?

DR SUTTON: The widest net without dragging domestic -- it is also being set to ensure that the average domestic user, yes.

10 Control of specific areas where saline intrusion occurs

SENATOR VIBERT: Thank you. Also, could I just ask you about the ability to control the areas where stress by the intrusion of seawater is actually apparent in those two areas? Would not restricting the groundwater licensing requirements just for those areas be sufficient?

DR SUTTON: To me that would be a sensible starting place that the sands on the east side of the Island have a major -- they're a major source of abstraction at present. I think it's about, on average, 500 cubic metres a day is taken out by the Waterworks Company, that it would be a proving ground perhaps.

DEPUTY RONDEL: You say the east. In fact that's from the west.

DR SUTTON: **West**, sorry.

11 No agreed understanding of the way water moves through complex fractured rocks

SENATOR LE MAISTRE: Deputy Baudains?

DEPUTY BAUDAINS: You will have heard me ask this question of other interviewees and I don't think I've heard your opinion of it before. I have some query as to whether, once we've collected the actual data that we have a number of boreholes and we have some boreholes which we know how much water has been abstracted from them, is that going to be a -- what sort of benefit is that actually going to be in guiding us to our further knowledge of Jersey's water supply. Will it be hugely beneficial or mildly beneficial or ...?

DR SUTTON: I think, as you said this morning, it is one side of the equation. Without an agreed conceptual understanding of the way in which water moves through the complex fractured rocks of Jersey, it will always only be one side of the equation. If you accept that, you know, you're looking at a 30 metre skin of rock which all water -- it's just yesterday's rainfall that falls on that, then it is probably valuable.

DEPUTY BAUDAINS: And also it does occur to me that we've heard this afternoon that there is water abstracted in fairly large quantities from an area where BGS had not given their attention. Is it your understanding that the water balance which has been calculated applies solely to that aquifer, the sort of top 100 or so of feet and that the water that has been abstracted from boreholes deeper than that is not really part of that equation?

DR SUTTON: The water balance has been calculated applies just to the rain that falls on the surface that infiltrates and seeps to springs or is extracted through boreholes. Whether that deep water comes from far away or whether there is deeper infiltration and circulation is not known and nowhere in any of the reports is there a geological log or a well log that shows where water comes into the boreholes of which rock types. There isn't, other than the sands that can't be seen and I really think you don't know at present. You really don't know.

DEPUTY BAUDAINS: Well, taking that further, we don't know yet. We have some evidence but there's not a great deal and hopefully we'll learn some more later on. If we do find - and this is purely hypothetical - if we do find that there are reasonable resources lower down than where BGS have examined, does that have any effect on the figures that we were dealing with or ...?

12 Components of the water balance

DR SUTTON: If there are other resources it changes the water balance and there are other components of the BGS water balance that one could argue with. For example, they say that there is no contribution from **Water mains leakage**, yet the Waterworks Company themselves say that they lose something between 10 and 20% of the water is lost from mains leakage.

The BGS state that there are 4,637 **septic tanks** on the Island. They themselves must be contributing a substantial amount of water. One could argue the figures of the water balance. One might have to accept that there are very good reasons, but they're not ones that I can see from the written evidence that's been presented to the Committee.

SENATOR LE MAISTRE: Our time is up for this particular point and so, could I thank you very much Dr Sutton. We may feel that we would like to have further time with you in open session.

(adjournment)

SENATOR LE MAISTRE: Now we continue with a further submission by Dr Sutton and I call on

Senator Vibert.

13 Comment on water divining

SENATOR VIBERT: Dr Sutton, you've actually heard two experienced water diviners this afternoon. I just wonder what they told us, which appears to illustrate that Jersey is awash with water, if you excuse the pun, way down beneath the surface. Does any of that surprise you?

DR SUTTON: Perhaps surprises me that there is quite so much in quite so many places but geologically it makes sense. I have no idea how water divining works, I cannot divine water myself, but there is -- very often if you have enough geological information to tie up with the history of water divining, there is an underlying geological reason there of major fault zones or folds in which the fissures are open and through which water can pass reasonably rapidly. So it doesn't surprise me but I have no idea how it ties up with the regional geology.

14 Rates of water flow

MALE SPEAKER: Can we just intervene there? Water divining is one thing but the actual evidence that they've submitted on the number of deep bores which produce significant volumes of water, up to 10,000 gallons an hour, do you find that rather surprising because that's the impression that we get with BGS's reaction to them?

DR SUTTON: No, I don't and if you -- talking about rates of water flow, you always get great confusion with units because some people talk in gallons per hour and some people think in -- I think in, sort of, litres per second is the unit I've grown up with. In sort of crystalline fractured rock through which water is passing through cracks and fissures, 4 or 5 litres per second is not an unusual yield of water and 4 or 5 litres per second is a gallon a second, it's 3,000 or 4,000 gallons per hour. If they'd said they were getting 60,000 gallons per hour I would perhaps have been -- but the numbers tie up with the sort of experience that emerges from the sort of rock units that are here in Jersey. You get them on the east coast of Ireland. They're not great aquifers, they're not going to produce, you know, water supply for a major city but they're substantial and they can support both agriculture --

15 Comparison of volumes of water supply in UK

SENATOR LE MAISTRE: Is this same volume found in the UK in different places or is that not an experience of the UK?

DR SUTTON: That sort of volume would be fairly typical of a good well not in a major aquifer. If you go to the chalk or the sandstone that are the major aquifers of central

England, you're looking at five, six, up to ten times that sort of volume of water being pumped for public supply. But it is a realistic volume to associate with some of the granites and volcanic rocks of mid Wales, some of the old granites of Leicestershire, but not universally through them. You've got to put the hole down where there is a fissured zone, where there is a fault zone or a fold. It's logical and the story is cohesive and you can't argue with (overspeaking)

SENATOR LE MAISTRE(?): What I was trying to get to is the map that Mr de la Haye produced showing a pepper pot of wells around the island. Would I be right in assuming that that's a very unusual situation in UK terms to find an area 44 square miles with that many boreholes?

DR SUTTON: That wasn't a major aquifer?

SENATOR LE MAISTRE: Yes.

DR SUTTON: If it were the chalk or the Sherwood sandstone --

SENATOR LE MAISTRE: Where the BGS had said there was no water?

DR SUTTON: Yes, it would be a good day for them.

16 Geothermal energy supply

DEPUTY RONDEL One thing that was mentioned, and I repeated it myself, hot water, possibly getting slightly away from the actual report but BGS have never picked this up in anything they've produced to us. Any chance of that ever -- harnessing that energy in the future?

DR SUTTON: I know the BGS -- well, no, perhaps not the BGS, the British government have spent millions in the 1970s trying to establish geothermal energy in the granites and rocks of Cornwall and it has never been developed to the point where it's economic. Now, the economics of it I don't know.

DEPUTY RONDEL: No. It was mentioned, that's why I thought I'd just ask.

DR SUTTON: It would be worth looking into.

SENATOR LE MAISTRE: However, I think that is straying from --

DEPUTY RONDEL: Straying slightly off the point.

17 Licence exemption for groundwater in fissured rock

SENATOR VIBERT: Could I come back to a situation which as we've already discussed -- and I put to you whether we should raise the level from three cubic metres to 10 and you suggested to us that that would be feasible to do. Secondly, I'd like to put to you whether, in fact, it would be helpful if we declared, or the Committee declared, that the bulk of the groundwater present in fissured rocks would be licence-exempt as a part of a proposal to actually control the water table?

DR SUTTON: At present I think that would be a sensible approach to take because even the BGS, in their more recent report, say it's complex and unpredictable.

SENATOR VIBERT: Right, because it would appear to me, from the evidence that we've heard today and looking at that law and hearing the evidence we heard yesterday, that we're actually using a sledgehammer to crack a nut here. How do you react to that situation?

18 Sledgehammer to crack a nut

DR SUTTON: I would agree with that from -- we were given three principal reasons for the law, if you discount everybody else has one so there should be one. With the exception of the sand aquifers, which the jury may be out on, there seems to be very little that is at present showing progressive signs of deterioration. So there isn't that for the bedrock aquifer.

There may be a need to have, if you like, on the shelf an instrument that could be used should the unexpected arise with climate change or major demands. If somebody wanted to build a nuclear power station, there would probably be other objections before water, but should a major demand arise or the unexpected occur in the next 20 or 30 years, to have some way of dealing with that. But beyond that, yes, I think, although I'm not a lawyer, but I think the present law is a sledgehammer to crack a nut, yes.

19 Obligation to protect finite resources - including deep level

SENATOR VIBERT: In the light of the information we've had this afternoon; it would appear that the argument that's being put forward is basically to protect the water table down to 70 feet. Now, the evidence we've heard is, in fact, there's a lot more water a lot further down. Now, most of the wells appear to be in that level, that are actually operating, so it's not really going to affect that top layer, those wells don't appearing to be affecting that top layer. It seems to be all coming much lower so there are two stratas. So I would have thought that, in my view, is another reason why it seems to be this law is missing the whole point.

DR SUTTON: Yes, but even that bottom layer must have a finite resource in it. If you look at sites where there is industrial contamination in Britain. This may be a totally erroneous analogy but quite often the very act of boring provides a passage for contamination near the surface in an old industrial site to get down to ground water. One could picture a scenario where, if large amounts of water were extracted from depth, if there is presently a gradient up from below, you might well get to a circumstance where there is a gradient down. All resources are finite and the one argument which I've heard over the last couple of -- the last sessions, that I think there is no refuting, is that there is an obligation on society to protect resources for our children and grandchildren.

SENATOR VIBERT: The difficulty the panel faces, of course, is that we have no evidence to show how deep that water goes and how long it will last and all the rest of it. I mean, it could be almost a finite position. If it's coming, as we've heard some of the evidence, from France, how could we possibly determine whether it's likely to dry up? The evidence that's been given to us is that from their experience they don't know if a well has dried up (several inaudible words). Now that's practical experience based on 25 years.

20 Next step: Chemical sampling of nitrate levels

DR SUTTON: Which is a substantial period of experience, and I would think the next simple step might be just to look and see if the chemistry -- you know, if the nitrate levels in a dozen of these deeper wells was consistently lower than the 50 or 60 mgs per litre of nitrate that's reported on surface water and on the wells for which there are no borehole logs that the BGS report, it would be a relatively simple matter to take ten samples from a group of wells, which Mr de la Haye said were cased down to the deep levels, and ten samples from shallower wells, and see if the water was different, and nitrate would be the tracer.

21 Lack of recognition of water diviners/well drillers

SENATOR VIBERT: Is it your experience that people of the kind of experience that we've seen today would be so ignored by a public department?

DR SUTTON: It's often been my experience that people who have letters after their name are very arrogant towards those that don't but it's almost always been unjustified.

22 BGS studies don't take cognisance of complexity of Jersey geology

DEPUTY BAUDAINS: We heard this afternoon, just not so long ago, of what appears to be a substantial water supply in an area where BGS suggests there is little or no water. Now, do you believe that they've done enough research and if you were them what would you recommend now?

DR SUTTON: It's unfair to criticise an organisation for one particular set of reports. I think their model of the --

DEPUTY BAUDAINS: I'm not suggesting they've got it wrong, I'm merely suggesting that perhaps it's not complete.

DR SUTTON: **I don't think it's complete. Their conceptual model of the hydrogeology of Jersey, that is published on the hydrogeological map from 1992, is totally consistent with a lot of the work that they were doing at that time on the crystalline basement rocks of continental Africa and this very much reflects the -- it's still the current understanding of drilling wells in large**

areas of crystalline continental basement. I don't think it takes any cognisance of the complexity of - I only learnt the word - of the brevarian(?) geology of Jersey, of the tectonic setting, the defamation, the nature and variable complexity of the rocks of Jersey.

23 Way forward

I suppose if you were looking for a way forward, the first thing I would look for is whether we do have two different waters that can be labelled by nitrate or some other factor. And the next stage would be really to capture the knowledge that is available from those who've practised geology and hydrogeology on the island for many years. I think that's a major shortcoming of the information that's been presented to the Committee at present.

24 How to test recharge rate at deeper levels

SENATOR LE MAISTRE: Would it be difficult to capture the information of the deeper bores in terms of recharge rates because clearly, if it is from water which has fallen over the Alps or whatever, doesn't matter where, one is talking about a different measurement of rainfall perhaps than we are actually experiencing on the island. So when the boreholes are sunk, is it reasonably simple, from a technical point of view, to measure at regular intervals the water depth in those circumstances or is that more difficult than the surface water table?

DR SUTTON: It's certainly not cheap. The conventional approach would be to carry out a pumping test or a series of pumping tests that you would pump one or two of these boreholes at as high a possible rate as you could sustain, possibly for a two- or three-week period. You would monitor the water levels around it, you might need to put in purpose-drilled observation wells within 10 or 20 metres of them, and you would measure the rates at which the water level fell and then, more importantly probably, you would measure the rates at which the water levels recovered. And if there were -- if, say, you pumped for two weeks at 20,000 gallons an hour and within three days of switching off the pump the water levels had recovered to the level that they were before you started, you would be reasonably certain that, in terms of a human lifetime, you probably had a substantial resource. But if, on the other hand, the water levels never actually recovered, you permanently dropped the water level by a metre or two, you'd know you were mining water. But any investigation of resources at depth is expensive.

SENATOR VIBERT: That's clearly something we haven't done.

DEPUTY BAUDAINS: Would that be possible to be done with the existing bores that we already

have across the island?

DR SUTTON: If the biggest size they've got is 6 inch or 150 mm, you're restricted to a 4-inch pump. And with a 4-inch pump you're probably restricted to, depending on the head you've got to lift, maybe a couple of thousand cubic metres an hour. It would be nice. I think I would take it one step at a time, see if there was a difference in the chemistry, look at what could be done with the existing boreholes, and if, five years down the line, it looked as though, you know, you were moving towards establishing that there was a substantial resource at depth which became an important strategic resource for planning the island's future, you then might move to the point where a sort of purpose-built and expensive test was worth carrying out.

But, no, I think initially I would work with what was there and with an attempt to capture the knowledge of people who've been involved for generations.

25 Trinity Catchment Scheme

SENATOR VIBERT: What appears to be lacking in what's happened is there's been no pilot, manageable pilot scheme carried out where in fact the water company would fund a pilot scheme.

DR SUTTON: For deep water?

SENATOR VIBERT: For either.

SENATOR LE MAISTRE: Well, yes, there's been the Trinity Scheme which presumably was a pilot scheme in that sense which measured stream and wells --

DR SUTTON: And measured rainfall, stream flow, evaporation and presumably relatively shallow water levels and the response over two or three successive 12-month periods.

SENATOR VIBERT: Do you consider that to have been sufficient in terms of gaining the knowledge before we produce a law of the complexity and size that we're being presented? Was that sufficient, in your view?

DR SUTTON: **I don't think we have any understanding of the deep groundwater that we heard evidence that it is there and, until there is understanding, my inclination would be that it is dangerous to attempt to control.** But I'm not a lawyer and I'm not really qualified to make that statement from a legal perspective.

SENATOR VIBERT: It's not really a legal perspective. It's a practical water --

26 Comparison between Jersey and other areas

DEPUTY HILL: With the -- you know, we've heard that they've got laws elsewhere, and not necessarily we should have one because they've got them elsewhere. On the other hand, there is a law elsewhere because there probably -- there may well

have been a need. How does Jersey compare with the number of boreholes and the water situation? Are we rather unique in our system or are we favourably compared, you know, with other places in the UK? We've heard that we could have 5,000 boreholes, we could have 10,000, we don't know but we know we've got boreholes. But is this similar to the UK or, in fact, even Europe because we're not just --

DR SUTTON: On Europe I couldn't comment. It's not dissimilar from parts of **Ireland** where, you know, individuals -- it's a large number of individual, relatively small, relatively low yielding boreholes. None of them on their own would be a municipal water supply. I think in the density, yes, it is possibly unique in that context, although if you moved to somewhere like the chalk of East Anglia in Britain you would find a similar density of boreholes but it's one large aquifer and the behaviour is consistent, it's consistent throughout. I think the density is probably quite high.

27 Water scarcity table

DEPUTY HILL: Leading on to that then, we had this evidence given to us this morning, and I'm referring to the sustaining water where we were shown at 11th, talking about this business about we've somehow come between Jordan and Yemen. Would you like to make any comment? I just feel that, you know, how did one come to base this? You know, we're saying -- because Jersey seems to be so different from those two places.

DR SUTTON: Without knowing the -- there must be some calculation in there which has made an allowance for evaporation. I don't know whether it's been applied uniformly across. If you take, very crudely, that Jersey is 100 square kilometres with 100,000 people and gets 1,000 mm of rain a year, you would end up with effectively 1,000 mm per head. So there must be some allowance for evaporation. Whether that's been uniformly applied, I don't know, and **I think it is totally unfair to compare a densely populated small area of land with an empty vast area like Libya or, on a smaller scale, like the highlands of Scotland.** The availability of that water to people doesn't -- you can make no evaluation of the availability of water to people from those numbers.

DEPUTY HILL: Because it would be fair to say that -- I don't know, I've not been to those two countries, but over in Jersey we reckon 50% of the island's still in agriculture so we've got a fair bit -- you know, we're not sort of a town-based or one of a desert, are we? So one --

DR SUTTON: No, and your rainfall is relatively evenly distributed throughout the year. If you go to some of the tropical countries, the heavens will open for three months of the wet season and then you'll have three -- then it'll be gone, you'll have a dry season for four months. **So there are 1,000 complicating factors: there's evaporation, there's the distribution throughout the year, there's the**

accessibility to population. That table would be a bit like taking the four divisions of the English Football League and saying Shrewsbury Town, who got 42 points in Division 3, are a better football team than Manchester United who only 38 points in the Premier League.

DEPUTY RONDEL: So therefore, if I could come in on that, we could discount this report really, in real terms, as being submitted, if anything, to possibly muddy the waters?

DR SUTTON: The motives I couldn't possibly comment on but I don't think it adds anything to the understanding of the situation.

SENATOR VIBERT: Well, having lived in **Australia** for 30 years, I see that Australia is way, way up in terms of abundant countries with 20,000 per 75, whatever that figure actually means. Knowing the country as I do and how dry the interior of Australia is, I think everything you've said about this table actually makes sense.

SENATOR LE MAISTRE: Well, that's probably Melbourne they're referring to there.

DEPUTY BAUDAINS: Is it not also important that - without going into the type of snow that British Rail has - the type of rain one has because if you have a lot of rain in a short period of time much will be wasted on run-off but if you have gentle rain over a long period of time you'll get more infiltration to the aquifer?

DR SUTTON: Or if you get a lot of rain when it's very hot, you'll lose it all. But, as I say, how the numbers are reached I don't know. If you get 10 mm of rain over 25,000 square kilometres, it's probably the same as 80 mm of rain over 10 square kilometres but it may all evaporate. It will all evaporate if it's desert and it'll all become snow if it's Iceland, which I think is very high up on the list.

SENATOR VIBERT: I know this won't mean very much to you but I'd put as much reliance on this as I'd put on the reliance of the Jersey Evening Post figures on a questionnaire relative to the bridge across the waterfront which came in with a number that was greater than the population of Jersey.

SENATOR LE MAISTRE: I think that we have probably exhausted the number of questions which we have at the moment so thank you again very much, Dr Sutton, for your submission and answering those questions.

DR SUTTON: Thank you.

SENATOR LE MAISTRE: We now bring the public session to a close.