TOWN OF ST. GEORGE
DEVELOPMENT REVIEW BOARD MINUTES
Wednesday, December 12, 2007

Development Review Board Members in attendance: Scott Baker, chair for agenda item #1; Marie Mastro, chair for agenda item #2; Lisa Beliveau; Connie Kendall; Matt Palmer; Dan Pillsbury; Ron Arms, alternate: Todd Pillsbury, alternate.

Also in attendance: Ray Martel, Lakeview Farm; Jane Stowell, Lakeview Farm; Sheila McIntyre, Summit Engineering; Tom Walsh, Attorney for Lakeview Farm; Craig Heindel, Consulting Hydrogeologist; Mike Lawrence, Landscape Architect; John Aleong; Joe Mastro; Brian Vaughan; Kelly Sayre; Allan Keyes; Ed Hanson, St. George zoning administrator.

The meeting was called to order at 7:03 pm

Agenda item #1: Continuation of the preliminary plat review for the proposed Lakeview Farm Subdivision.

A description of the application was read and after reviewing the order of events, Scott Baker, chair, asked for disclosure of any conflicts of interest or ex parte communication. Scott stated that there were three items of ex parte communications to be entered into the record. First) a letter that was submitted on December 9, 2007 by the following residents; Marie Mastro, Joe Mastro, Lynn Kabot, Dean Adams, Robert and Laurie Walker, Brian and Amy Vaughan and John Thibault. Second) A letter that was submitted on December 12, 2007 by John Aleong. Third) A letter that was submitted by Joe and Marie Mastro regarding the potential conflict of interest within the board.

Scott asked Marie to review her letter and identify the potential conflict of interest. Scott added that it was in reference to Todd Pillsbury and that a letter had been sent to Todd informing Todd of this situation. Scott gave Todd the opportunity to respond to the letter. Todd responded by handing out copies of a letter that he had written to the board.

Scott asked for any further input on this potential conflict of interest. Connie asked for clarification that it is correct that Todd be appointed as alternate for the hearings on this subdivision – should it be Ron Arms instead? It was discussed that both alternates are needed to bring the number of board members to seven.

Lisa made the motion that the board go into deliberative session to discuss the two letters and the potential conflict of interest. Connie seconded the motion. No discussion. The motion passed unanimously. The public was asked to step out of the room.

The meeting was reopened and Scott announced the decision of the board. Following the Rules of Procedure and Conflict of Interest Policy it was decided that a conflict of interest had not occurred therefore no action will be taken.

Scott then asked if anyone was seeking interested party status. The interested person record and service list is attached to these minutes. Applicants and interested persons were sworn in.

Scott asked if anyone had any additional written information to submit and requested that written information be made available not only to the board members but to all interested persons as well. Sheila submitted – The Evaluation of Water Supplies written by consulting hydrogeologist, Craig Heindel of Heindel & Noyes.

Scott asked Sheila to make the presentation on the well studies and the water evaluation. Sheila suggested that if there were further questions that Michael Lawrence could answer in regards to the visual aspects of the project that Michael would be allowed to go first.

Connie asked Michael Lawrence to clarify past testimony that the tree buffers were a minimum of 80 feet. Michael said that was correct – "80 feet would be the minimum". Michael said that he looked at the plan again earlier and that nothing was less than 80 feet – "generally, we were talking about how far the houses set back – in some cases it is 150 feet – in most cases it is significantly more than 80 feet". There was some confusion on the width of the tree buffers – Connie pointed out that many tree buffers were less than 80 feet in width (some 15 to 25 feet in width) and questioned if Michael was defining the buffer as the distance to the house site.

After studying the plan, Michael stated that "lots number 3, 4, 5 and 6 are adjacent to the woods where there is a lawn to the east. Lot # 3 has a buffer of approx. 200 feet and #4 has a buffer of 170 feet. On lot # 5 the house sits at 150 feet but we are showing about a 60 to 70 foot clearing so there is approx. 70 to 80 feet adjacent to #5. Lot # 6 sits 160 feet and has about 100 feet of buffer and lot # 7 is significantly back at 250 feet from the property line. In addition, on #6 and #7 the actual property line is another 300 feet beyond the edge of that woods and that includes the Christmas tree farm and then another 100 feet of existing low vegetation that is being allowed to continue to grow."

Connie pointed out that with the storm water basin on the north side of lot #3, there is only about a 15 foot tree buffer. Michael said that was correct however there is approx. 100 feet of trees north of the emergency right of way between the road and the existing outer edge of the trees. Matt stated that there is a buffer but not necessarily on the proposed lot. Connie pointed out that the 100 foot tree buffer that Michael was referring to would not be a part of the no tree cutting restricted area. Michael said that was correct.

Connie stated her concern that in some cases many of the trees that would hide the homes from view were on neighboring properties – outside of the no tree cutting restricted areas

and what she was looking for, as a definition of a tree buffer, was a buffer that could not be cut and would be on each individual lot – not on adjoining property. With that understanding, Connie asked Michael if he would agree that there were tree buffers that were less than 25 feet in width. Michael said yes.

Scott asked Sheila if the storm water basins on lot # 3 and 4 will be cleared? Sheila answered yes – what they are showing on the preliminaries are what they are proposing to be the limits of clearing. The final plat plan will show the actual dimensions. Some areas will need to be cleared for utilities, for grading and for construction. Areas need to be cleared for grading of the sites to allow the storm water systems to work – also for the wells and septic systems. What they are showing is clearing that is required for things like swales and storm water basins.

Shelia stated that one of the reasons they put the storm water basin on lot #3 is that is that "we knew it would not be visible from off site – it needed some clearing in order to be constructed, but it is not in an area that would be visible. From Mike's presentation, it was shown that the visibility in that area is relatively low from off site."

When Connie questioned past statements that talked about a minimum tree buffer, Sheila replied that each lot has been looked at individually with its own grading and visibility characteristics and there isn't any one specific tree buffer that would fit every lot. The actual boundaries will be defined at final.

Michael added that his overall sense is that the development is well back in the trees but he did agree that lot #3 will have the least amount of buffer. "However, there is a 70 to 80 foot area of trees . . . and, there could be trees planted adjacent to the storm water basin to reinforce that area". But even without that, his sense is that the area of concern (lot #3) the house is not going to stand out – "it will be backgrounded by a significant area of trees. There certainly is going to be some cover in front of there and from the distances we are talking about, I don't think it is going to be visible."

Michael added again that at final, the cleared areas will be staked out and exact measurements can be taken – buffers are somewhat general now. Ron added that what we are looking for is terminology that will guarantee that these homes will not be viewable from Oak Hill Road or the general viewscape from the north.

Sheila stated again that at final review the actual tree clearing limits will be defined on the plans and the actual measurements will be depicted for each lot.

Connie then asked where the right of way for lot 8 is located. The submittal stated that it is across lot # 7. Sheila agreed that it was incorrectly stated in the submittal – the right of way is actually located on lot # 6. The right of way shares a portion of the driveway on lot # 6 and where the driveway turns at a 90 degree angle, the access breaks away to lot #8.

Sheila stated that they had additional written information to submit – an updated letter from the Vermont Land Trust.

Sheila then introduced Craig Heindel from Heindel and Noyes – and asked Craig to present his well study. Craig stated that he is a consulting ground water geologist and that he has been working in Vermont since 1980. Craig passed out copies of his report. Craig stated that he was asked to answer two questions: Is there likely to be an adequate water supply for the new housing and would those new water supplies create unacceptable levels of interference with existing water supplies?

In order to answer those questions, "you have to look at the geology". These will presumably all be drilled bedrock wells. The way wells in bedrock obtain their water is that they encounter fractures in the rock. The rock in Vermont is solid and does not have water in the pores of the minerals. Instead, water travels only in the fractures. Different rocks have different abilities to produce water. A well in Vermont bedrock is drilled down through the soil made up of glacial till to the bedrock. The till is made up of a material that varies in size and is very dense – so water goes through till very slowly. It is not like sand or gravel that has big pore spaces that the water can easily flow through. This portion of Mt. Pritchard is made up of glacial till at a variety of thicknesses – it may be 5 feet thick or 50 feet thick. Then the drill bit encounters the fractured bedrock.

The traditional bore hole size is 6 inches in diameter. The fractures that are intersected by this well bore are generally more than a single fracture. There can be a whole interconnected three dimensional network of fractures in the bedrock. The water that is in those fractures is generally new water from precipitation and snow melt that fell on the ground surface perhaps a few years or a few months earlier. It is not ancient water.

The precipitation and snow melt trickles down through the soil and then gets into the interconnected fracture network. If those fractures are interconnected to a well bore, the pump will draw the water out of the fractures, up through the pipe and into the house. The water that is in the fractured network re-supplies or recharges the well.

The bedrock geology in this area has a record of having widely variable well yields. They can range upwards of 20 to 40 gallons a minute – commonly they are in the range of 2 to 15 gallons per minute – but there are certainly many wells in this area that are a very low yield with less than a gallon a minute. This is because it is a relatively soft rock. When the rock is soft, the fractures do not develop as well as brittle rock. Also, soft rock fractures are not as well connected. For these reasons, it is not unusual to have low yield wells in this rock formation.

Craig pointed to his well logs that were a part of a door to door study conducted by Wendy, a geologist. These represent the well logs of the people that were home during the two days and one evening that Wendy stopped by. The range of well yields is shown in a column marked "driller's estimated yield and gallons per minute". This is the information that is provided on the well driller's log. Since about the late 1960's, a well

driller was required to file a written report of the well – which is public information on the State website. The well yields range from ¾ of a gallon a minute up to 18 gallons a minute. In many cases this rock formation is not a great well producer.

Craig said "so how do I conclude that there is enough water supply for these lots"? "The method that hydrogeologists use to answer this question – is there enough area available for the new wells for the snow melt and precipitation that falls on that area to provide enough water to run a house. There is a relatively standard set of calculations that we go through to get to that number. It basically uses an estimated infiltration rate of water that percolates down through the soil to get into the rock. That infiltration rate depends on the overlying soil. You can imagine that if the overlying soil is mostly sand then you can envision that perhaps half or more of the rainfall and snow melt that falls on sandy or gravel soil is going to go right through that and get to the rock. But that is not the case here. The estimate that is in a lot of state documents for glacial till is about 7 inches per year of infiltration through the till into the rock is a reasonable number to use for till. I used that 7 inches per year. That is compared to about 35 to 40 inches a year of total precipitation. So it is a pretty small number – 1/7 or 1/6 of the total precipitation is estimated to get through glacial till into the underlying rock. So, then you then simply say, how much area is available to these seven house lots. If we allow 7 inches of rain, we can calculate the amount of water in 7 inches of rain and say, is that enough water to supply 7 houses?" Craig stated that these calculations are shown on pages two and three of his report – and that he concludes that "theoretically there is enough water falling on the seven lots and up to the top of the hill - there is a bit more hill beyond – in fact if you look at the area that is encompassed from the lower edge of the seven lots up to the top of the hill – about 63 acres – which is a relatively small recharge area but it is not the only recharge area for these wells. But if you use that very conservative number of just those lots and up to the top of the hill – 63 acres – and put 7 inches of rain through 63 acres you get 4, 5 or 6 times more water that is needed for each house. If you take a more conservative, larger area of water since it will be possible to drill 1,000 foot deep wells, if you go out to some larger distance and I have arbitrarily chosen on the last map – if you look at the purple line around that area that is an elevation of 760 feet - which is a number that goes down along West Oak Hill Road – West Oak Hill Road is about 760 – that purple line is at about 760 feet in elevation and goes all the way around the hill to the other side. And, certainly, a well that is 1,000 feet deep might be able to reach – might be connected to water bearing fractures that are out into that range somewhere. Of course, a 1,000 feet deep, you are starting at an elevation of maybe 900 to 1,000 feet where the 7 lots are, so the bottom of a well that is 1,000 feet deep is going to be at sea level or below and this purple line is only around that elevation of 760. Conceivably, it may be possible for a 1,000 foot deep well to draw water from even further away. But if you take that 760 – that's about 1,500 acres and if you put 7 inches of rain on 1,500 acres you get plenty, plenty, plenty of water. So theoretically there is enough water available – clearly not only for these 7 houses but for – say, I estimated roughly 32 other existing houses in the general area. What I am saying by that is from the north – it is the row of houses that are on the north side of Martel Lane. That is the northern boundary, approximately, of these 32 houses. To the east, it is the houses on the east side of Oak Hill Road. To the south – it's the houses along the south side of Mt. Pritchard Road. On

the first map it is the green line around that area – there is about 32 houses there and you add the seven houses that are proposed – you come up with 39 houses. There's plenty of water theoretically falling on that 300 some acres that are surrounding – that are encompassed by those 39 houses".

"So, the question is - there clearly is enough water – now the challenge is in this rock type – to get that water into the well bore. There's lots of ways that can be done and it has been done in the past. One thing that is important to do is to put your old understanding and what you have heard from well drillers - starting about 10 years ago and older things have changed in the last 10 years – in many, many ways. Well drillers have been able to drill deeper – 10 years ago, I almost never heard of a 1,000 foot well. Now well drillers tell me that they routinely can go 1,500 feet, 1,700 feet, 2,000 feet – they have the equipment to do it – one of the well drilling companies that routinely works in this area is Spafford – he can go 2,000 feet – and has done 1,700 footers in a number of places. So, they can go deeper than they used to – they can hydrofracture. Hydrofracturing is injecting water under high pressure in the well bore and that tends to enlarge the existing fractures. It's a technology that comes out of the oil field 30 – 40 years ago where they did it in huge ways – and they scaled down that procedure which was used to open up fractures to suck more oil out of the ground. They scaled that down to water well size and they have a relatively good success rate at increasing well yields. It's not a guarantee – although some of the fracturers will keep going until they get you the water that you need. Hydrofracturing is a very valuable tool."

"So, going deep, hydrofracturing and then larger diameter wells – the drillers are finding that an 8 inch bore hole is a significant advantage over a 6 inch bore hole because it encounters a little bit more water. The final tool is to install a storage reservoir - it shouldn't really be called a final tool – that's the tool that really should be put in front of all of these. The reason is that you don't need much water to provide 24 hours worth of water for a house. The State regulations call for 490 gallons a day for a four bedroom house. It's not very much water. The typical water day, if you want to call it that, is a 12 hour water day. If you conservatively ask for 24 hours of water to be provided in 12 hours of pumping, that's only ¾ of a gallon per minute. You take 490 gallons a day which is a typical four bedroom – it's actually quite conservative – it's a large amount of water compared to what most four bedroom houses use – you take a 490 a day water demand and you ask a well to produce that in 720 minutes of pumping - half a day's pumping – that's less than a gallon a minute – it's 2/3 of a gallon a minute. So, it is not very much water. So, one of the things that has been done for many years is to deal with a low yield well which maybe can make a gallon a minute – that's not enough to flush a toilet or run a water hose – a water hose opened up will typically run about 8 gallons a minute – a shower is 2 – 3 gallons a minute – so you need more for very short periods of time – you need more than a gallon a minute. The way that works for people that have moderate well yields is that the water in the casing itself –in the well bore is a long skinny storage tank. And the pump takes the water out of that long skinny storage tank pretty quickly. If you flush two toilets, and take a shower and run the washing machine, you're asking for maybe 15 gallons a minute to be provide – but only for 90 seconds. That comes very quickly out of the storage volume in the well casing. A one gallon a

minute well cannot sustain that pumping requirement for very long. But since it is not asked to be run at 5 or 15 gallons a minute for very long periods of time – only for a few seconds every now and then – a one gallon a minute well can keep up with that by slowly replenishing. And by considering that in a well casing you have a storage volume, in a 6 inch well every foot of water you have in a 6 inch well is 1.5 gallons. So if you have a 600 foot well, and the pump is at 550, and the static level is at 50 feet, you've got 500 feet of water in your well. That's 750 gallons. 11/2 gallons per foot in a 6 inch well. And an 8 inch well is more than that. So, that storage volume is quite useful. Many people have dealt with low yield wells by having a reservoir placed. You can either put tanks in your basement or you can do a 1,000 gallon buried out in your yard. That's another possibility. What that does is allow the well to replace the water you use out of the reservoir – the well feeds the reservoir at a very slow rate. A second pump takes water from the reservoir and feeds the house for those short term bursts of water that are needed - 10 gallons a minute to run a garden hose or the washing machine – 2 – 3 gallons a minute to take a shower – these kinds of short term instantaneous demands. So, certainly reservoirs are a possibility."

"What the drillers have told me – and it has been my experience – is that with the combination of all of these old techniques like a storage reservoir and moderately old techniques like hyrdrofracturing and the newer techniques like larger diameter and going very deep - they feel confident that they will be able to encounter enough water to supply these seven houses. One of the interesting things about this hillside is that there is a geologic fracture underneath here – and beneath that upper soft rock is a limestone rock that's more highly fractured - the fault roughly parallels route 2A and then it slopes gently downward to the east. Under the hill there might be 1,500 feet deep. But they can certainly get to at least 2,000 feet deep. It could be well possible that they would penetrate the low yield soft rock that I explained to you and get into that lower limestone and there, they are very likely to get 40 a gallon a minute wells – 140 gallon a minute wells – that limestone is very highly productive. There are a lot of wells in that - that produce large amounts of water. It might even be possible to find one well that serves the whole development. That is a possibility - that there is the ability to get deep enough to get into that higher yield rock."

"To summarize, theoretically there is enough water falling on the ground surface in the vicinity of the proposed wells so that there will be enough water for them theoretically – and enough water for the existing 30 – 40 houses in the same general area. The question is then, can we get that water into the well bores with these various techniques of 8 inch wells – going deep – hydrofracturing and storage – it is my professional judgement that it is likely that there will be water solutions for these seven houses. I've got to say likely because there are spots where you have to make a lot of holes to get - I wouldn't be able to guarantee it. I'm just telling you that the technology and the geology tells me that, as a professional, that it is likely that there will be solutions. As far as interference – or stealing water from neighboring wells – the rule of thumb that I have seen and used professionally for a very long time is that when individual wells serving individual houses, not big commercial establishments, but single family residences – if those wells are spaced more than 100 feet apart I almost never see significant interference between

those wells. I do pump tests every year – I have been doing these for 25 years – on wells all over the state and I look for that kind of thing and generally I have been able to say that my sort of rule of thumb is about 100 feet apart. In this kind of rock – I would recommend trying to get the wells at least 200 feet apart. The site plans that have been produced does have wells locations on the site plans – and some of those wells are closer than 200 feet. I have spoken with Sheila and the engineers in her shop and they have indicated that they will be able to move those wells around to get to that 200 foot spacing. And, none of those wells, I believe are within 200 feet of neighboring wells. So, that is one consideration that I might recommend – to try to get to 200 – or at least 150 feet - go a bit beyond this rule of thumb that has worked for me in the past of 100 feet and get to 150 – 200 feet separation of the wells. And with that, I don't think we would see significant interference between the wells – particularly if they are deep."

"Some cases where I have been brought in on this and I am able to essentially guarantee that based on the geologic record that I am absolutely certain that there will be adequate water supply for everybody. I can't quite come to that level of professional certainty here but it is certainly very, very likely that with the technology that is available now – that improves the likelihood."

With the end of Craig's presentation, Scott asked if the members of the board had any questions. Connie asked Craig to further explain to the adjoining landowners who have come to these hearings reporting very low to no water yields why that it their experience. Craig answered that there are wells in this rock type that have low yields because the rock is soft and the fractures are not as well interconnected as in harder rock The water is not able to travel in the fracture network . Connie asked for clarification about what happens in each individual's 200 foot radius – the rock formation that is beneath their well – how can it be stated that one well will have nothing to do with their neighbor's well 200 feet away? Craig repeated that he had not seen extensive interference with neighboring wells. Typically, the distance between wells is 100 feet.

Scott stated that it seems odd that if you are relying on water to be collected over a large area that you would not be affected by what happens outside that 100 foot radius. Craig answered that when the well pump is turned on, it draws down the water table in that fractured rock. The shape of that draw down is like a funnel. There is a lot of draw down very close to the well and then it is not a linear straight line up to the undisturbed water table. The cone of depression in the water table is very deep near the well bore. There could very well be measurable interference – a few percentage points – out several 100 feet but not enough to significantly impact the yield of the neighboring wells.

Ron asked if Craig was saying that it is not likely that a single, primary vein runs horizontally for a long distance providing just one primary source – but rather with this type of bedrock - it is more like a spider web? Craig answered that it is more like a spider web and it is possible that if there is a high yield fracture that two well bores happen to intersect, then it is possible that the activity in one well can cause a disturbance in a well that is 500 or 1,000 feet away – particularly during the drilling. The drilling operation – the installation of the well bore is a pretty violent operation. They use a lot of

air and water under pressure, in the hole, to blow the rock chips up out of the hole. So it squirts rock and sediment into the fractures as well as going up into the bore hole – as they are hammering the bore hole down through the rock – it's a pretty violent operation on the rock aquifer. Craig stated that he has seen short term disturbances happen at distances of much more than 200 feet. That disturbance usually goes away within a week or two after drilling – after that fracture pattern gets cleared of that short term disturbance. Neighbors that are several hundred feet away may experience a short term siltation of their well when a new well is drilled. That generally happens because there happens to be a high yield fracture interconnecting the two and the energy in the dirt is transmitted laterally. But once the drilling operation is over, then the water well pumping for the house – it draws water into the house at a much slower rate.

Matt asked Craig about his years of experience. "We will be placing some emphasis and reliance on this study – Could you tell us if the state licenses or certifies hydrogeologists and what CPG stands for?" Craig answered that CPG stands for certified professional geologist and in Vermont there is no licensing or certification of geologist but that he did have a national license. The CPG is a national license. Also that he has served on state task forces on water supply and wastewater regulations for decades. Craig stated that he is licensed in New Hampshire – Matt asked what initials he uses in New Hampshire. Craig answered that he was pretty sure that he uses CG in New Hampshire – for certified geologist.

Connie asked why it was a trend to drill deeper, 1,000 feet or more, and use 8 inch casings? Craig answered that it used to be that if drillers were asked to drill in areas with low water yields, they only had 6 inch casing options. Drilling equipment has come down in price somewhat and geologists have been asking them to use 8 inch casings – and there has been some success. So more and more drillers are realizing that it is worth it to have the equipment that can do this. Now more and more Vermont drillers have the 8 inch capability. Connie asked why more people are choosing to drill deeper with an 8 inch casing – would it be a reasonable assumption that water is becoming harder to find? Craig answered that he did not think so. An indication of that would be a declining water table and there are very few places in Vermont where we are seeing a declining water table. Where that is happening most is down in the ski valleys where there are lots and lots of wells and they have not yet developed a municipal water system. There you have hundreds of wells. Craig also offered that it could be because there is a higher expectation for high yield wells and the drillers are responding to that market demand. It used to be that a 6 inch well was pretty expensive and to go deeper than 600 or 700 feet was more than the home owner wanted to pay – they would take what they could get with a 6 inch well at 600 feet and live frugally with the water that they got. Now people are saying – "if you've got the capability, go for it".

Connie asked if the trend to drill deeper using an 8 inch casing could be because homes are starting to be built in areas where water is harder to find - the areas that have water have already been built on? Craig answered that could be the case – but he didn't think that people were basing their decisions on where to buy a lot on what the well drillers are

saying they may be able to get. Water yield is "pretty low on their list of screening criteria".

Lisa asked what the storage capacity would be for an 8 inch well? Craig answered that it is probably twice, at least. –"it goes by the square of the diameter". Scott offered that it would be 78- 79% greater. Craig estimated two and a half gallons per foot. A 6 inch well is a gallon and a half per foot. 8 inch wells encounter more water bearing fractures – 360 degrees all around the well bore.

Scott then opened the discussion up to the public.

Brian Vaughan asked that if a well is drilled 1,000 feet down and the yield is about a gallon a minute – what is the guarantee that the yield will stay at a gallon a minute? Craig said that there is no guarantee. Brian added that diminishing wells seem to be the case in this area – and that prior to buying his house, it was stated that the well was down 135 feet and yielded 15 gallons a minute. When they bought the house, they had ¼ gallon a minute – so he had to go down 800 feet to get a gallon a minute and he was wondering if in the future he would have to go down another 500 feet to get more water. Craig answered that he could not say yes or no but that it was relatively rare that wells drop off in yield to that degree but it is not unheard of. Hydrofracturing often is successful in returning at least some of that yield back. Brian questioned if you can hydrofract in soft bedrock – he was told by his well driller that hydrofracturing could cause the well to collapse and that they had to put PVC liner all along the well. Craig answered that hydrofracturing it is not as successful in soft bedrock as in hard rock. Some well drillers are now inspecting the well with cameras to look for the most suitable places to do the hydrofracturing.

Marie asked that since there is soft rock in this area, would Craig not recommend hydrofracturing? Craig answered that a well driller would evaluate each well bore-typically this is done by putting a camera down each hole. Depending on the depth that the current well is – well drillers will often recommend that deepening be done before hydrofracturing. Often as you go deeper you get denser rock that is more suitable for hydrofracturing. Marie stated that she knew of a well in the area that collapsed.

Marie asked about the fault that Craig described earlier – that Craig had stated that depths there may have water. Wells in the area have uranium in the water – is that a concern when you drill deeper? Craig answered that there is not enough information yet to understand the pattern of uranium rich wells. There are many deep wells that do not have uranium and some shallow wells are high in uranium. It would not be a reason to avoid deep drilling in this area. Marie asked if there is a higher incidence of uranium in the wells in this area along Hinesburg, St. George, and the Mt. Pritchard area? Craig said that he could not answer that – he had not prepared for answering that but he did know of some high uranium wells in this area. Marie added that a study had been done that was on the website that showed that there were some high uranium wells in the area.

Marie asked that when you drill deeper, is it possible to pump the water up from such a low depth? Craig answered yes - that you would put in a larger capacity pump. The well drillers wouldn't drill that deep if they couldn't install a pump. The may use a higher density pipe – or go to steel. Overall, it is a more expensive installation for sure.

Marie stated that her well is 905 feet deep and that she has less than a gallon a minute. Her well went dry this summer. Spafford said that one thing that could have been done is to put in a steel pipe but that would have been very expensive. Craig asked how low their pump was – Marie answered 700 feet – but to drop it another 500 feet would have been more expensive. Craig agreed that it would be more expensive. Craig stated that "presumably, in the real estate transaction process of these lots, the information about the potential well difficulties here would be known so folks could make that decision – a buyers beware decision".

Matt asked if the potential water issues will be discussed with the interested buyers. Sheila answered that it is a real estate question and that she didn't know that there are water issues yet. Tom added that they could disclose what the professional geologist's opinion was - that he doesn't think that it is a problem.

Marie asked about the characteristics of some of the wells that had elevations similar to lots 5, 6 and 7? Craig answered that the range of yields are pretty scattered. Looking at the north side of Martel Lane, the Thibault well is 2 gallons a minute, the Soloman well is 18 gallons a minute. Wallace and Bosenberg were not home when the survey was done. The Hoars could not find the well log but they told Wendy that it was fine. At the very top – the White Living Trust well is one gallon a minute. Jane Stowell's well is 4 gallons a minute. Ray Martel's well is a spring. If you go south to your house (Marie's) you have a very low yield. Lynn Kabot has 1.4 gallons a minute. They were not able to find any information on the new house – the Neff property which is pretty high. So, it jumps around. The way they gather the information is to go door to door to look at each well log and if they went back out, they could fill in more information. Starting about 15 years ago, well drillers were required to put an aluminum I.D. tag on the wells. With the number on the tag, the well can be tracked down the system. The tags will have the driller's number, the well number and the date.

Dan asked about Marie's well. It was established that Marie's well was dug in 2004. Marie stated that when it was first drilled, they got nothing. It had to be hydrofracted to get ¾ of a gallon a minute. Marie asked about the notation made by Wendy next to the Solomon well information – that she did not understand the notation. Craig answered that he did not understand it either.

Marie asked Craig if you ever drill and then monitor the wells to see what the impact will be – you mentioned that you cannot guarantee no interference but you thought it would be very unlikely. Is it a common thing to do in an area such as this?
Craig answered that it is not a common practice for single family residences but it is a requirement for public wells that serve 20, 30 or 40 houses. Marie noted that she has done almost every one of the options that Craig had outlined in his testimony. She has

gone as deep as she could without putting in a steel casing, she has hydrofractured twice and she has storage and her situation is not improving. A "huge concern" for her is that along with the proposed seven new home lots there are two other lots up by her that have been approved but have not been built on yet. Marie asked if in an area like this where it is difficult because of the type of soil- can the adjoining wells be monitored to see what the impact will be? Craig said that it could be done but it is a big expense for a small developer – the family members are not really developers; they're farmers. So, it would be a very big expense and the question is if it is an appropriate expense to require of them. Marie stated that she has a lot of money invested in her well and that she doesn't know if seven houses behind her will suck it dry – that it is a big gamble that she is taking.

John Aleong asked about the dimensions and the equation of the cone of depression that Craig referred to. Craig offered that it may be best for him to give John a reference where he could look up the mathematical equation. John stated that he understood Craig to say that the nature of the soil and rock in the area is characterized as having low yields – the yield of the whole area is low. Then you give us theoretical evidence that says 7 inches of water infiltration a year will give us water and presumably will feed 39 houses. John asked for the mathematical equation that was used to establish this. Then, you gave us four options – go deeper, hydrofracturing, larger diameter casing, and storage. With all of this that you have stated – you are saying theoretically we will have water. Then why is it that we have dry wells – because you have said that because of the large acreage, we should have a lot of water. There aren't a lot of houses on the hill right now. Craig answered that the rock is not well fractured and so not every well bore will encounter enough water bearing fractures to supply a house at the depth that well is drilled. John pointed out that he knew there were problems with the ANR data – does ANR depend on the honesty of the well drillers? Craig answered yes and because of the discrepancies in the ANR data, they went door to door to collect as much information as they could. John said that the theoretical discussion says that there should be enough water on the hill but this is not supported or cross validated by the actual data – there are problems. There are people drilling multiple wells at large depths and are still not getting water. Craig stated that the challenge on this site is that there appears to be enough water falling on it – the question is how can the well bores encounter enough water to supply a house – and that is where the 8 inch diameter, going deep, hydrofracturing are solutions that the well drillers have found to be workable in this kind of terrain.

Brian stated that if you have to go down 2,000 feet to get water it could cost 40,000 dollars. Craig said that it could certainly be upwards to 20,000. Brian said that it would cost more than 20,000. Craig agreed that it will be an expensive hole with an expensive pump system.

John asked if there are places in Vermont where Craig's four recommendations have worked. Craig answered yes – even in this area, in Chittenden County. Well drillers are drilling 1,300 feet, 1,700 feet, 1,800 feet with 8 inch diameter and they have found water for them. It makes sense geologically but then, you don't know until you do it. Matt asked if the well drillers get paid even if they don't find water. Craig answered that some

of them say – if we drill a dry hole, you don't pay us. Sheila offered that with some, if you pay a premium, they will guarantee that they will find water.

John asked what the rainfall and snow melt has been on Mt. Pritchard - is the seven inches an average? Craig answered that the seven inches is the estimated infiltration rate through glacial till soils for till in Vermont – not for Mt. Pritchard but a statewide average. The typical rainfall for this area is 36 to 40 inches a year – and 7 inches is estimated to infiltrate through till that is on this mountain. John said that we don't know what the actual infiltration rate is on this mountain. Craig answered, no we don't – it would be such a monumental study that is wouldn't be warranted for the seven months of the year.

Marie asked how the quality of the water is established before drilling. Craig said that it would be known by asking neighbors if they have had their water tested and would be willing to share the lab results. There is no state requirement or mechanism for testing the water quality of single family residential wells. Marie asked if water quality is posted on a website – Craig answered that he didn't think so. Marie stated that it is a significant cost to have uranium removed from the water. Lisa offered that she found on the internet a source that stated that specifically Mt. Pritchard is prone to radon in the water because of the fault.

Scott asked if there were any other questions. If the questions were not related to the water issue, Scott requested that they be brief since the primary purpose for having the Martels return for the hearing this evening was to address the water issue.

Matt referred to a statement made in the group letter submitted by adjoining residents – that there was an ad in the paper for a lot that emphasized the views. The Martels stated that the lot was not a part of their proposed development – it was a sister's lot – the White property.

Scott asked for clarification on the number of lots that are proposed for this subdivision. A lot of what was talked about at the last hearing was based on Act 250 review. There was some concern that with the change from 10 lots to 9 lots - Act 250 review would not be required. Tom answered that all of this property is subject to Act 250 no matter what happens with this development. "If it is one lot or 50 lots it has to go through Act 250 because the jurisdiction pre-exists this project. Any material change to the project requires Act 250 review." "A seven house lot subdivision would certainly be a material change requiring an Act 250 permit application".

Dan asked to see the Vermont Land Trust letter that was submitted earlier in the evening. Ed made copies for everyone.

Marie referred to the letter that she and other neighbors submitted as well as the letter John Aleong submitted and asked if there will be an opportunity for some of the residents to verbally express the concerns stated in the letters. Scott said that it was his understanding that at the last hearing, we addressed a number of those issues and we

continued the hearing with the sole purpose of having the applicants answer the one question that we asked. We received the letter from the group of residents and Mr. Aleong - the letters that have been submitted will be reviewed. If there are questions, they need to be very brief.

Marie stated that the letter from the group of residents requested more information on test pit data – this was not included in the package. Was this included in the information that the board was given that she does not have a copy of? Scott said that he did not have that request because the board received the letter last night, or two days ago, which was not enough time for us to contact the applicants to say that we have a request for more information. Tom offered that there is test pit data provided on G1 - Sheila offered that there is test pit data offered on the test pits used for the septic designs. Marie asked, "on every one?" Sheila answered that there wouldn't be any reason to document all of the test pits that were used. Marie asked if there was a change from sketch plan to preliminary because suitable soils were found. Sheila said yes, and that the new test pits are documented on the plan.

Connie asked what the process would be to build any structures such as barns or sheds on the two areas marked as prime ag. soils on lot # 8 and the 25 acres of lot # 9. Sheila stated that the 25 acre prime ag. portion on lot # 9 will continue to be a working farm so the Land Trust is not looking for a conservation easement on that portion. It will still be a part of the open space and there is no development proposed for it and there won't be because of the prime ag. soils. Tom added that from the state perspective, because these prime ag. soils are subject to Act 250, the Martels would have to go through Act 250 and say that they would like to build a barn on prime ag. soil - which is land under jurisdiction. If Act 250 found that it would be an adverse impact to the ag. soils, the state would probably say no. Ed added that in any event, the town has no jurisdiction over agricultural accessory buildings. The Martels would have to notify the town if they are planning to put an accessory out building on any agricultural property but we have no jurisdiction – we wouldn't have the right to refuse to let them build it. The building would have to be exclusively used for agricultural purposes. Tom added that there is an Act 250 criteria that reviews impacts to ag. land.

Marie presented a 3-D model that she made of Mt. Pritchard. Each contour represents 20 vertical feet. It has been done to scale with the help of Brandy Saxton of PlaceSense and Chittenden County Regional Planning. Each white pin represents existing houses and the red pins represent the proposed houses by Lakeview Farm as well as two houses that have not been built yet. It is approx. 1,200 vertical feet from Oak Hill Road to the top of Mt. Pritchard. Oak Hill Road is approx. 80 vertical feet higher than the highest elevation of a house in the Forest. There is clustering that has been done on Mt. Pritchard but to date it has occurred only in the lowest elevations. There has never been clustering at the higher elevations as currently proposed. The Neff house which is at the highest elevation is not visible because it is not in the line of site from Oak Hill Road – it is set very far in. Tom asked if this was leading to a question. Scott said that Marie asked for two minutes - Matt stated that if any member of the public wants to speak, we should hear them regardless. Marie continued by pointing out that lots 3 through 7, designated with red

pins, do not sit back like some of the white pins which you cannot see from Oak Hill Road. The top of Martel Lane is actually 250 feet from the top of Mt. Pritchard's peak – it is 250 feet in elevation change and significantly less steep at this point. This is where the original two lots were proposed. Marie offered to leave the model with the board if it helps to understand what the subdivision will look like. Scott said that it will be entered along with the written materials as part of the record. Tom asked if the size of the pins to scale with the rest of the model? Marie said no. Scott offered that with each contour marking 20 feet, the pins are probably about 30 to 35 feet in diameter. Tom asked if any living vegetation is shown on the model? Marie said that it wasn't intended to be a visual analysis, it was intended to show elevation.

Scott asked if there were any further questions. Kelly Sayre said that she would like to make a comment – that she was impressed by Craig's presentation – that he adequately answered the questions to the best of scientific abilities and she wanted to thank Lakeview Farm for "going to that degree". Allan Keyes said that he was an adjoining landowner and that he hoped the board will find a way to accept this application – it is an incredible asset for the public.

Ron made the motion to close the public hearing. Todd seconded the motion. With no discussion, Scott restated that the motion on the table is to close the public hearing. The motion passed unanimously.

Scott notified the applicants that they will receive a written decision from the board within 45 days.

Agenda Item #2: Zoning Administrator's monthly update.

Agenda Item #3: Other business.

The minutes from the DRB November meeting were reviewed. Lisa made a motion to approve the minutes. Ron seconded the motion. The motion passed unanimously.

The meeting was adjourned.