diamond mine. Ekati just north of Lac de Grade and not too far south of here, somewhat warmer climatic conditions, but very, very similar terrain conditions to the Jericho site.

We have designed and constructed five major dams at the Ekati diamond mine. They are listed on the slide here. Three of those dams we would put into the broad category of frozen-core dams with the first one constructed in 1997. So we have seven years, eight years of design construction and operating experience with this type of dam in this environment, and all of it has been very positive indeed.

There are other dams at Ekati that we call hybrid dams, and these are lined rock-filled dams that are situated on a permafrost foundation.

A little bit of background on what is a frozen-core dam, and how do we design a frozen-core dam. Everyone who lives in this environment is very well aware of the properties of the permafrost that form the upper crust and extend to many hundreds of metres.

We, as design engineers who work in the north, feel very strongly that we need to use permafrost to our advantage. We use permafrost as a core material in a dam to prevent seepage of water through the frozen core and impound a reservoir.

What you see here is a simple frozen-core dam, the blue core is a core of sand and gravel. If you could imagine it, it would be like a frozen esker. And on that frozen esker, we would put a protective pile of rock which is a surrounding medium that protects the frozen core from the warm summer temperatures.

The design of a dam such as this has to take into account a warm-water reservoir that forms on the upstream side and never freezes. So we have a warm heat source that is causing some thaw of the permafrost underneath that new reservoir, very similar to what you would have under a natural lake.

And on a downstream side these dams, you have heat removal during the cold winter months as a result of the cold air temperatures, and there is a balance that is struck within the thermal condition within the dam such that the blue zone or the frozen core zone remains in a permafrost condition. And we adopt a temperature of minus 2. We don't want to see any part of that frozen core over the life of the dam go above a temperature of minus 2.

A dam such as this, when it is frozen, will contain water perfectly. There would be no seepage of the dam. If the core were to thaw at sometime in the future, this would become a leaky dam. There would be leaking from the dam, but the dam would not fail.

When we design these dams, and the early work that was done was for the Ekati diamond mine, and this is a sketch from the original environmental assessment report for Ekati diamond mine in 1997. And it shows that we design these using modelling tools that -- on our computers -- that allow us to predict quite accurately the future temperatures within this frozen core to be sure it stays frozen. And when we do that analysis, we take into account all aspects of the history of the dam. And in this case, there was a construction portion of the dam, the brown zone here, which lasted about three years, two years. The filling portion where the reservoir rose against the dam and the temperature rose to minus 2. The operating portion of this dam in this particular analysis went out to about almost 30 years where the operation was maintained at a full water reservoir, what is the temperature, and finally during the reclamation, what happens to such a dam if it is left and not decommissioned as part of the reclamation phase.

And through all of these analyses, we always take into account the natural variability in the climate, and we are also looking at factors such as the global warming trend that we are hearing so much about affecting the North these days.

So this is pretty typical of the type of analyses that we do in order to satisfy ourselves that we have a frozen core down here which will remain in a frozen condition and not leak for the operating period of such a dam.

Some of the examples that I will show you of projects that are complete at Ekati, there is actually two frozen-core dams in this photograph. This dam in the forefront is our most recent dam, it is called the Bear Claw dam, and it is a diversion dam where they are developing a new pit.

And in the background there is a second dam which we call our Panda diversion dam, which is sitting right on the edge of the Panda pit and diverting water into this diversion channel. They are both frozen-core dams. This is the first dam that we constructed. This is the most recent dam that we constructed, 2003, only a year old.

One of the features that we have learned over the years of operation of these types of dams and design and monitoring is that we want to ensure and take all precautions against the possibility of thaw of the permafrost foundation. And to do that, we install these tubs at the base of the dam that lead to these pipes sticking up here, they are -- they have a fancy named called a thermosiphon. They are becoming more common in the Arctic. I can't think of any buildings in Kugluktuk that have thermosiphons under them, but certainly there are some in Inuvik and there are some in Yellowknife.

But these are a passive tube that enhances the refrigeration at the base of the dam and provides additional protection against the thawing at the bottom of the dam.

Here is a photograph of these tubes actually being installed in the dam. They are out in what we call a key trench, which is excavated down into the permafrost before we actually start to construct the dam, and they are laid out in this fashion and then extended to the radiators which dissipate the heat from the ground in the wintertime to the cold winter air.

To construct a dam like this, we use -- we start by an excavation down into the stable frozen permafrost, and we do that very carefully, cleaning it off very carefully. You can see a fellow in the background with an air compressor actually blowing the dust right off of the exposed permafrost before we place any materials.

We very carefully prepare -- this core material is prepared following a very comprehensive quality control program. It is a specially graded gravel that is very much like the gravel that you would see on a gravel road, like a road-crushed gravel. Prepared in the wintertime, inside a building at just the right amount of water added to condition it properly before it is taken to the site. It is placed in the wintertime. We only construct these dams in the wintertime, placed in thin layers such as this, secreted out like you would wet concrete, and then it is left to freeze. And each layer is frozen in place and before the next layer is put onto it. So the core is actually constructed in a layered frozen condition.

And as you can see, as the core comes up, the front surface is shaped. More recently we have been placing this material, this textile material on the front face of the dam as shown by Mr. Scott. This is what we call a geocomposite clay liner, and this is just a secondary contingency liner in case we have any cracking as a result of contraction and cracking within the frozen core. This will give us some additional time for the healing of the cracks before we get water infiltration into the core.

You can see in this photograph the sequence. We have the frozen core here, we have the liner, we have a padding material on the top to protect it. Then we have a finely graded rock which is transition material, and then we have the regular run of quarry rock over the top of the dam to top it off and provide overall stability.

Some of our dams use a different type of thermosiphon. This is the thermosiphon like the horizontal tubes, but these particular tubes are vertical, allowing us to extract heat from the foundation material, and below the dam, cool it -- super cool it, in fact, and dissipate that heat to the air during the cold winter months.

In the foreground here you can see steel tubes which are the ground temperature instrumentation sites, very similar to the ones that Mr. Scott showed on his diagram.

I would just like to show you two quick photographs that illustrate how we construct and what these divider dikes look like. This is the divider dike similar to -- this is the divider dike constructed for Ekati. The one that would be built across the Long Lake processed kimberlite containment area will be quite similar to this, but a much smaller scale. These are very important structures put into the lake in order to ensure that we do not get circulation patterns developing in the lake that could carry the fines right down to the lower end of the lake where we want to discharge the clean water. The fines build up behind it.

These are leaky dams. The water builds up in front of the dam, it filters through this specially constructed layer of filter material, it is a sand and gravel which is placed on upstream slope of a rock fill and encapsulated into some transition material, so it doesn't wash into the voids of the rock fill. A rather simple structure, simple to build, but very important to the overall function of a tailings or a processed kimberlite basin such as the one that we are proposing to build here.

And here is a photograph, I will conclude with this photograph, a photograph of the raise of the -- of one of these divider dikes happening at Ekati taken in August 2001. The original dike was constructed and used for a number of years, and then they came along and placed the second raise. You can see this brown strip on the front face of the dike here is the actual filter material, it is being trucked in and placed with small bulldozers.

In behind it, you can see the gray transition material, and all of this material in the back is rock fill, which is the stabilizing portion of the divider dike.

You can even see in this photograph the difference in colour of the water on the upstream side. It looks a little bit turbid, a little bit murky compared to the water on the downstream side of this dike. So this dike is doing its job.

We have just completed a five-year review of the function of this system for Ekati diamond mine. Having measured the depth, depositional environment in these cells and found that clearly these dikes are doing a very important job within this overall water clarification system, and that was one of the reasons why we felt that reinstituting it back into the processed kimberlite system at Jericho had good merit.

Thank you, Mr. Chairman, that's basically all I would like to say.

GREG MISSAL: I would like to call on Pete McCreath now to present his portion of his presentation.

MR. McCREATH: Mr. Chairman, members of the Board, staff, ladies and gentlemen, my name is Peter McCreath. My company is Clearwater

Consultants.

I have been working on water-related aspects of the Jericho project on and off since the mid-1990s. Aspects including hydrology, water management, water handling aspects of the project.

What I will talk about this evening is present the plans for managing water on the Jericho project site.

General layout of the site facilities, Cam Scott talked about these in general terms. What we have is the processed kimberlite containment area. There will be a series of collector ditches and sumps around all the site facilities, including the waste dumps, the ore stockpiles and the low-grade stockpiles, which will collect runoff and seepage and direct the water either to the open pit or ultimately be transferred to the processed kimberlite containment area.

The open pit will have a sump or a series of sumps from which water will be pumped to the PKCA. On this drawing, there is also shown a series of three ponds, Pond C, Pond B, and Pond A which would be constructed, if necessary, to provide additional containment of runoff and seepage water from the different site facilities.

There is also a diversion of water, the C1 stream which flows or right now flows right through the area which will be taken up by the open pit. There will be a diversion constructed to convey the stream around the pit, back into its natural outlet and back into Carat Lake.

There is a small channel proposed upstream of waste dump area number 1 which would divert clean runoff water away from the waste dump and directed into lake C4.

The final facility I will draw your attention to is the fresh water intake causeway. This is the causeway from which processed water and potable water will be drawn from Carat Lake for use in the project.

A schematic drawing summarizing what I have just been talking about. Runoff and seepage from all the site facilities will be contained. In the initial years of operation, any runoff and seepage from the waste dumps, the overburden stockpiles or the low-grade ore stockpiles will be directed to the pit area, and from there it will be transferred by pump to the kimberlite containment area. If necessary, the other additional ponds A, B and C will be constructed, which will serve both as sediment control ponds and as collection ponds to transfer the water to the PKCA.

There will be water coming from the possessing plant as part of the -- to convey the fine processed kimberlite from the plant for deposition in the PKCA. There is storage available within the PKCA. And in order to maintain a balance, excess water will be released from the system on an annual basis through Stream C3, into Lake C3, and ultimately into Carat Lake and the Jericho River system.

Fresh water, as I said, is drawn from Carat Lake into the processing plant for use in the process and for potable water use.

So in general terms, the water management plan involves the diversion of clean runoff water away from site facilities. Water that will not be impacted at all will be directed back into a natural receiving environment. The diversion C1 also includes -- the design is included, the incorporation of fish-friendly features, pool and ripple structures, which Rick Pattenden will be mentioning later, this is to encourage -- provide more fish habitat within the diverted portion of the stream.

Fresh water for process and potable use, as I said, drawn from Carat Lake. All the site facilities, any runoff and seepage water coming from it will be collected with the water being transferred to the kimberlite containment area.

The ponds A, B and C we are identifying at the moment as contingency items which will be constructed if required, and the decision for that will be based on such considerations as water quality, suspended sediment that may be contained in runoff or seepage from the dumps.

Storage is available within the kimberlite -- processed kimberlite containment pond, and there is adequate storage in there to contain all the runoff from the site facilities for up to a two-year period. Excess water will be released during the summer months, June through September, in a controlled fashion such as to mimic the natural flows within the Stream C3 receiving environment.

The design criteria that we have adopted for the various water handling and water management facilities include the following, the diversion channels will be designed to convey peak flows from a very rare flood event with a return period of 200 years. Probability of occurrence of that event in any one year is less than one percent, about one-half of one percent chance in any one year that that could happen.

The fresh water that is being withdrawn from

Carat Lake, we expect a maximum sustained rate of in the order of 40 cubic metres per hour. And to put that into context, that would represent less than one percent of the total flow at the outlet of Carat Lake into the Jericho River.

Sumps within the open pit would be designed with a combination of storage and pumps to minimize flooding and minimize disruption to mining operations for something like a ten year to a 25-year return period event.

Within the processed kimberlite containment area, there will be sufficient storage up to the level of the spillway, the emergency spillway to absorb, at any time in mine operations, two years' worth of runoff from all of the site facilities. This contingency is there that if there is problems identified with water quality concerns, for example, there would be sufficient time to store the water within the pond and apply contingency measures to address the concerns.

There is an emergency spillway designed to protect the west dam from overtopping. This spillway is designed for a very extreme event referred to as a probable maximum precipitation. And, in addition, it is designed such that there is enough capacity even assuming that the pond would be full up to the spillway level at the start of that very rare event.

The collection ponds, A, B and C, if they were required, would be designed for a 200-year event, probably a snow melt event, with a combination of pumping capacity from the ponds and storage within the ponds for both water and sediment.

We have carried out a water balance assessment for the site as a whole. A model was developed which included both quantity, water quantity and water quality aspects.

Just summarizing the base case assumptions that went into the model, they included the eight years of ore processing, average precipitation and evaporation conditions, and again all runoff from all site facilities directed to the containment area.

The process plant will include reclaim of water from the kimberlite containment area during the summer months. There is an allowance for significant quantities of ice to be entrained within the deposited fine process kimberlite. This is a conservative assumption to make sure that we have enough storage volume behind the containment dams.

A minimum operating pond volume of in the order of 100,000 cubic metres to ensure that there is adequate settling volume for sediment within the pond.

Releases during the summer months between June and September, which on average over the life of the mine would amount to a little less than 500,000 cubic metres per year as a total volume of excess water that would have to be released from the system to maintain the system in balance.

As I mentioned, the spillway level is at elevation 523. Cam Scott showed you that the impervious core level is a metre higher than that at 524.

What the water balance model demonstrates is summarized in this graph which shows how the volumes increase over the life of the mine. The upper line shows the total volume in the pond, including both solids and water. And you can see after eight years of operation that there is something in the order of 900,000 cubic metres of water, plus solids contained within the pond. That would translate to an approximate elevation just under 520 metres.

The spillway, as I mentioned, is at elevation 523, and at that level there is nearly double that volume of storage available, 1.8 million cubic metres. So there was a lot of contingency storage available, enough to absorb runoff for two complete years from the complete site.

Closure conditions at the end of the processing period. We are projecting that the quality of water within the kimberlite, processed kimberlite containment area will be acceptable for direct release into Stream C3. And the approach that will be taken is we will minimize the volume of water that would be contained within the pond by either breaching the west dam or lowering the spillway. What this would mean is that the existing natural flow regime would essentially be restored to Stream C3.

The other facilities around the site, the waste dumps, the stockpile areas would all be reclaimed, covered, and runoff from these areas would be directed towards the open pit.

The pit will fill by a combination of direct precipitation, rainfall and snowfall on the pit, plus the runoff from the other site areas, and we expect the pit to fill in something less than 20 years after the completion of mining.

This filling time for the pit could be reduced by adding additional water into the pit from Carat Lake, for example. This could reduce the filling time to perhaps as little as five years. The need to add additional water will depend on such considerations as water quality that has being monitored during operations and during the early days of closure. And depending, again, on water quality, the outflows from the open pit could be routed directly back into the lower reaches of Stream C1 and then into Carat Lake, or a separate outlet channel could be constructed for the pit outflows, and that would generate -- there would be a new lake created there in that pit flowing into Carat Lake.

And that completes my presentation, Mr. Chairman. Thank you very much.

GREG MISSAL: Thanks very much, Pete. I would now like to ask Kelly Sexsmith from SRK to come forward for her portion.

KELLY SEXSMITH: Good evening, Mr. Chair and Board. My name is Kelly Sexsmith. I'm a geochemist with SRK Consulting, and I have been working on the Jericho project since 1997.

What I am going to talk to you about today is some of the water quality issues on the site. First, I'm going to talk about characterization of mine rock and processed kimberlite at the site.

I'm going to talk about the concentration estimates that we prepared for the mine waste materials which were presented as part of the impact assessment for the project. As well, I'm going to talk about the concentrations that we expect in the discharge from the processed kimberlite containment facility, and I'm going to talk about the derivation of proposed discharge limits which will be a part of the water license for the Jericho project.

Key water quality issues at the Jericho site are nutrients from the waste rock stockpiles and the processed kimberlite containment area, sewage is another source of nutrients, and these are ammonia, nitrate, nitrite and phosphorus.

Suspended solids are another issue at the site which are just basic particles that are stirred up during the process of construction. Those can be controlled through best-management practices at this site.

A third issue is the potential for acid rock drainage and metal leeching from the waste materials. In particular, the waste rock piles, the coarse processed kimberlite stockpiles, the low-grade kimberlite stockpiles and the fine processed kimberlite that will be in the processed kimberlite containment area. Lots of big words.

All these materials come from the open pit that will be developed during mining, and this just shows a representation of the geology in that pit showing the mostly granitic waste rock which is in red and pink surrounding the kimberlite ore in green. The red and the pink are not different rock types here, I apologize for that, they are what we called inferred versus known geology outcrops. And drill core define the rocks very clearly in some areas and less clearly in others.

There is also a material we call diabase that runs in a little dike that crosses the east side of the pit. The granitic rocks and the diabase will go to the waste rock dumps, the waste dump number 1 and number 2. The kimberlite will -- most of it will go to the processing plant, and out of the processing plant will come the coarse processed kimberlite and the fine processed kimberlite. A small amount of low grade kimberlite ore may be also stockpiled onsite.

We did a fairly extensive program of geochemical testing on all these materials, the tests included, and the list shown there, acid base accounting to determine whether or not the material could generate acidic water. Mineralogy test to determine what minerals were present, metal analysis, leech extraction tests to see whether there were any soluble metals in the rock, characterization, water analyses on the process water from the processed kimberlite containment area, settling tests using waste rock and overburden from the existing exploration development onsite, and characterization of actual seepage water from the existing development waste rock pile onsite which was produced when Tahera extracted their bulk sample during exploration.

The results of these programs showed that the granitic waste rock materials and the diabase dike, as well, would have a low potential for acid generation. The seepage from this material would have neutral pHs, similar to tap water or slightly more alkaline than that. They would also have a very low potential for metal leeching, with slightly elevated concentrations of aluminum, copper and uranium and very low concentrations of other trace metals, and I will put those numbers in prospective a little later.

The kimberlite ore, the low-grade ore and the coarse and the fine processed kimberlite would also have a very negligible potential for acid generation. They would have slightly alkaline pH water and a low potential for metal leeching. A