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Lucapa Diamond Company Limited

Site Visit - June 2015

1.0 Background & Logistics

- Departed Sydney on Sunday 31 May for J'burg
- · Lodged Angola visa application in Pretoria on Monday 1st June
- · Passport picked up Friday 5th June
- Departed for Angola on Monday 15th June
- Stayed overnight in Luanda on the 15th
- Flew by commercial flight on 16th to Saurimo and drove three hours to reach Lolo Camp at about 4pm. Geological presentation by James Napier, Lulo head geologist.
- Wednesday 17th, spent the day inspecting mining operations, the plant and a number of mining and sampling locations
- Thursday 18th, left camp at 4.45am for three hour drive to Saurimo, then charter flight to Luanda and commercial flight to J'burg, arriving at approx. 6pm in the evening
- Lucapa management also invited Dr John Ward, a well-known diamond geologist to site to provide his insight into the alluvial and kimberlite resource/ prospectivity



Diagram 1: Location Map of Lulo Project, in Angola

2.0 Summary and Conclusions

2.1 The Nature of Alluvials

There is a tendency of investors to shun alluvials, be they for diamonds or gold. Objectively this can be justified by the randomness of the distribution of the product, which in most cases precludes the calculation of JORC resources. On the emotional side of an investments decision we have all seen examples of grandiose statement by shysters that can create great excitement, and never deliver - but alluvials don't have a monopoly on this type of promoter.

But what are alluvials anyway? In fact, an alluvial diamond deposit occurs when nature has done the first step in mining and processing an orebody for us, using the forces of erosion and fluvial action. In many cases the top 50-150m of a kimberlite has been eroded and the diamonds have been transported to another location. Changes in topography, fluvial action and other environmental features have taken the diamonds along the path of least resistance to locations where energy levels are lower and to where there are physical trap sites. This is just like a concentration circuit in a mining treatment plant. The diamonds settle in a suitable location and remain there until such time as there are further forces applied that may rework the deposits, transporting and concentrating them yet again, our until miners find and extract them.

There is nothing evil about alluvial diamonds per se, it is just that the randomness makes predicting their whereabouts more difficult than for a kimberlite pipe. It is a moving feast, in reality. On the flip side though, the concentration of the diamonds through weathering and transport can mean much higher grades and values than were in the original pipe. It is understandable that the richer prize is harder to win.

2.2 Alluvials Diamonds in Angola

There are many mechanised alluvial diamond mines operating in Angola (apart from garimpeiro operations). These range from one man outfits to larger scale workings employing large teams of operators. Many of these generate handsome profits. The optimised scale is believed to be in the order of 20,000 cubic metres per month.

2.3 Comparing Angola and Botswana

Angola is different to nearby Botswana, which is a major producer of diamonds from kimberlite pipes. In Botswana, it is a lower rainfall country. There has been less aggressive erosion of kimberlite by fluvial action. Diamonds and indicator minerals have not been transported as far away from the original pipes. That makes it easier to locate the productive source pipes using soil sampling. On the other hand Angola, whilst being very rich in the number of kimberlite pipes, has a more challenging environment when it comes to finding the source pipes. There are plenty of pipes and many of them are diamodiferous, but they tend to be lower grade than in Botswana.

It has been observed that there have not been any productive kimberlite pipes found in Angola without the aid of identifying and analysing of alluvial deposits. Geophysics alone and associated soil sampling and drilling hasn't been enough. There are many anomalies that could be pipes. Even when they are confirmed to be pipes they still have to be shown to be diamondiferous, and then they have to show that they are economically diamondiferous.

Proving the economics of a lower grade pipe involves extensive bulk sampling. A minimum of 50,000 m³ should be mined and in some cases 100,000 m³. This is no small undertaking. It needs more than a 10 tph pilot or sampling plant. Normally one would do sufficient bulk sampling to produce a minimum of 3,500 carats for feasibility purposes.

In Southern Africa it is not uncommon for kimberlite pipes to take more than 10 years from initial discovery to a decision to mine. There are many examples of control passing from the original discoverer to one or more subsequent owners. It would be fair to say that diamond mines are made, not found. A discovery needs to be optimised and it is essential to have the best operators, not just optimists. Many pipes sit in the wrong hands and nothing happens until the right guys get involved.

Sure, alluvials suffer from an element of randomness, but they can be a much faster route to production, they involve less capital expenditure, and they can offer extraordinary profits when the grades or high value diamonds are there.

2.4 Relationship Between Lucapa's Alluvials and Kimberlites

The alluvial gravels on the Lulo concession extend for a distance of over 50 km along the length of the Cacuilo River, though not in a continuous sheet. Lucapa uses test pitting as the primary tool for determining where the gravels exist. While they are termed Calonda or Calonda-like, analysis suggests they are much younger in age and therefore not genuine Calonda.

The gravels vary in thickness but generally range from 0.2m to 1.5m, and typically less than 1m. They lie beneath soft sandy clays that can be up to 7-8m thick but usually much shallower, often 4-5m. The overburden is easily mined by excavators. A soft plasticine-like clay underlies much of the gravels. The overburden is back-filled into previously mined locations adjacent to the working pits, which makes rehabilitation easy and lower in cost when compared to hard rock mines.

Analysis of the gravels reveals large, well formed illmenite grains and frequent garnets. The shape of these suggest limited transported distances, frequently as proximate as 1-3 km. The nature of the recovered diamonds, being large and angular, is consistent with there being short distances to the pipes.

The river systems that have transported the diamonds are not large, so there has been limited opportunity for deep gravels to accumulate. The clay basement has not provided much opportunity for potholes to provide trap sites. The smoothness of the surface has not been of assistance in allowing deposition of gravels that could have provided imbrication sites that would normally offer preferential diamond deposition sites. Thus the distribution of diamonds is more homogeneous than in deposits elsewhere, with the exception being where there are crossover points as the river meanders from one side of a channel to the other, over many thousands of years. Other exceptions would be the occasional bar or structural uplift that also provide sites for concentration of diamonds.

Thus Lucapa has reasonable confidence that where it finds the gravels it will consistently find diamonds. It is unlikely to find amazing pods of very rich grades but the run-of-mine production, with the high proportion of Type IIa diamonds, seems reasonably assured.

The extraordinarily high proportion of Type IIa diamonds recovered to date is not seen as an exceptional outcome. Rather, it is the proximity to the Craton boundary that is deemed responsible for the high proportion, so it should be expected to continue. This results in very high value stones but the same location also means that the pipes in the region are not likely to have very high grades of carats per tonne. Thus while it is a big win with respect to values of individual diamonds and therefore the estimated average \$ per ct price, there is a trade off to some extent with lower grades. On balance it is still a positive.

The prospective grade of the kimberlite pipes is not really an issue for the alluvial diamonds as the natural concentration of the diamonds in the weathering and transport process has provided a natural uplift, which can be seen in the positive economics experienced to date.

2.4 Implications for Kimberlite Exploration

Lucapa has an abundance of targets from geophysical work. According to the latest presentation there were 296 targets and 96 of these have already been found to be kimberlites or probable kimberlites. The next step in the exploration program is to find out how many are diamondiferous and once that is established, what the average grade and price are. Not all diamondiferous kimberlites are economic. In fact, most aren't.

Having many diamondiferous kimberlites can be a mixed blessing as it costs money to assess them. Drilling can be employed to get deeper samples but the generally accepted view is that you need to mine and process at least 50,000 cubic meters to obtain a representative sample. Even then the outcome is frequently not binary. Maybe the results are outstanding but more than likely they will just lead to a recommendation of more extensive and expensive test work.

For a company in Lucapa's position, with limited access to finances, it needs to consider that the allocation of mining and processing equipment to the bulk testing of kimberlite pipes comes with an opportunity cost. Is it better to concentrate on maximizing production from alluvials, where economies of scale play an important role, or should capacity be adjusted to allow for non-income producing kimberlite testing activities?

It is repeatedly said that the main game is the kimberlites. Institutional investors in particular espouse this view. There is the belief that success on this front will lead to a market capitalization of \$0.5-\$1bn in size. However, there is no guarantee of success and there is no accurate way to estimate the time line to such success - or the cost. It is still a matter of trial and error testing the portfolio of pipes. The large number of pipes doesn't necessarily increase the chances of having economic pipes.

One line of thought is that the mining of the alluvials could be one of the most effective methods of zeroing in on the pipes with the best grades. As already mentioned, these alluvial diamonds haven't travelled very far. If in the alluvial mining process there are channels that show above average grades, they could point to a better source pipe nearby. If the alluvial production results are carefully played and analysed, you could be killing two birds with one stone, gaining valuable knowledge at no extra cost. Focusing on where tributary streams come into the Cacuilo River, offering a new entry point whereby diamonds enter the main river, would be a sensible approach.

In the opinion of the author, Lucapa should be concentrating it efforts on the establishment of a profitable alluvial diamond mine and scaling volumes in the first instance. This is lower risk and more readily obtainable in the short term. A profitable mining operation will reduce the dependence on equity market financing, minimise dilution of existing shareholders, and provide better funding for the kimberlite exploration program.

3.0 Operations

3.1 Expansion of Mining Fleet

- a new fleet is being purchased from Caterpillar on HP arrangement
- fleet comprises an excavator, dozer , grader and three ADT trucks
- due to start arriving on site the week beginning 29/6/15
- assembling equipment and commissioning as well as training new operators is to occur over a number of weeks with expectation of full operation by late Q3 2015
- witnessed the construction of maintenance and engineering workshops Comment: The fleet is badly needed. Whilst on site there were a number of pieces of equipment not working, for reasons of breakdowns and lead times in getting spare parts

3.2 Treatment Plant

- needs modifications to the front end feeding bins by December, which will enable the plant to keep throughput up in the wet season (process clayey wet material optimally). This will cost about \$0.75m, but the process can start with a 10% deposit. It would take four months to order and then install
- currently there are small amounts of clay going out to the oversize pile from the scrubber. These may contain diamonds so the oversize is retreated to ensure zero clay balls report to tails. This is an inefficient process and therefore needs to be minimized. This should be alleviated by the installation of an open chute vibrating grizzly feeder which can shake off oversize which is discarded and the remaining material can then report to the scrubber (which is only working at 50% capacity now)
- getting ready to move treatment plant operation to two shifts per day currently training employees to become plant operators
- ore stockpile running at 800 m3, enough for two shift of plant operation



Diagram 2: Scrubber Trommel



Diagram 3: Receiving Bin/ Ore Feeder



Diagram 4: DMS Circuit

3.3 Recovery and Sort House

- Management would like to spend capex of \$2.2m to increase safety, security, technology (XRT sorter) and value add with an ability to add a diamond acidisation/ boiling plant
- currently fairly standard system, using single pass XRF technology. This is being replaced with 2 flow sort machines with dual pass systems that have been ordered and will be installed in Q3 2015.
- s.g. of ilmenites is 4.8, diamonds 3.5
- higher count of ilmenites suggest higher grade of diamonds
- want to be able to direct feed oversize (+32mm) through improved technology (XRT sorters) rather than feed through the DMS. This is particularly relevant to recovery of Type IIa stones as the XRT systems look for carbon 6 as opposed to luminescence. Type IIa diamonds do not luminesce to the same extent as lower value Type I stones



Diagram 5: Recovery and Sort House

3.4 Phase 2 Expansion

• relates to arrival of new fleet taking capacity to 20,000 BCM/month by the end of Q3 2015 and optimization improvements above

3.5 Phase 3 Expansion

- will take capacity to 40,000 BCM by mid 2016, with another fleet expansion (\$5-6m). Includes two excavators, four trucks, a dozer and a grader
- involves Sort House modifications (\$0.5m)
- installation of an in field screening unit (separate scrubber and screening plant at the gravel source) to screen/ wash gravel at source to reduce volumes transported (\$1.2m)
- engineering works covering crane, workshop (\$3m-4m)

3.6 Mining

- witnessed the mining of Pit 3/4 at MB31, where gravels are up to 50m wide, but with some preferential channels
- gravel horizon at about 7-8m depth, requiring two overburden passes with the an excavator
- beneath the gravels layer is decomposed bedrock
- overburden is a clayey red sand that is removed through free digging. Top 15 cm is sandy topsoil
- it is not a case of having jackpot potholes as it is a low velocity environment on a flat basement with more consistent (though not homogeneous) distribution of diamonds. The grade will vary depending on which are the most influential source pipes
- overburden ratio varies from 2 to 8m, but averages about 4.5:1
- there are no issues with boulders
- · need a geologist at the mining face to ensure control over dilution
- mining in two shifts 7am to 11pm at night, five days per week



Diagram 6: Excavator removing overburden at Pit 3/4 in MB31



Diagram 7: Mining face showing sandy clay above gravels at Pit ¾, in situ weathering



Diagram 8: Gravel horizon being mined



Diagram 9: Gravels spilling onto clay basement



Diagram 10: Basement clay after gravels mined



Diagram 11: Coarse Ilmenites in the gravels (black pieces)

4.0 Geology and Exploration

4.1 Gravel Resources in the Terraces

- gravel horizon varies from 0.2m to 1.5m in thickness. Gravels are generally small with no large boulders. They appear to come from a low energy environment. Plenty of clays are still with the gravels but these are probably from decomposition in situ.
- there are 50 km of river terraces that host gravels (full length of the Cacuilo river on the mining lease). At the rate of 20,000 BCM/month, the current identified resource estimate in a small part of the lease area has a life of three years, so resource definition of extended gravels along the system is a priority. It will be a function of resource delineation work ahead of the mining plan.
- to date the gravels have been prospected through use of excavators and hand pitting, but this method denies the use of the same excavators for the mining of income generating gravels. Thus there is an opportunity cost with the current small fleet
- It has been suggested that a tractor mounted auger drill could more rapidly and efficiently identify the gravel direction. This would cost about \$300,000 and would offer much greater flexibility.
- It was commented that where there are gravels at Lulo there are diamonds, so there is not thought to be any risk encountering to many areas of barren gravels. The grades will vary from location to location, but they should always carry some grade. At higher throughput rates, the lower grade areas become economic
- Significant numbers of ilmenites and garnets were noted in the field. Their shapes and lack of abrasion evidence suggested minimal transport distances from source
- E46 located about 18 km away from the plant, hosts the bulk sample Block 14, which had the best gravel thickness with gravel sampling resulting in the kimberlite being found (where drilling didn't). Garimpeiros historically were working right up to the river at the E46 terrace area. LOM mined 240 m³ and recovered 52 diamonds at a grade of 22 cphm³. Average size was 1.1 ct, largest was 6.95 carats. This potentially 240,000 m³ block could be home to 50,000 carats. This mining area would need the in-field screening plant noted above to minimise cartage to the plant



Diagram 12: E46 Mining Block showing wide gravel zones

4.2 Gravel Resources in the Cacuilo River Bed

- there have been no indications of locals diving in the river to mine gravels, but that doesn't mean that it didn't happen. The locals don't bother to keep records
- the Cacuilo River is is slow moving and meandering. It varies up to 20m in width and is usually only a few metres deep (except in the wet season). Thus there will be the opportunity to divert the river and mine riverbed gravels potentially very significant
- The prospectivity needs to be evaluated and tested first. This would involve a \$100,000 dredging rig with suction pumps. Then, if positive, the bends in the river could be progressively mined after the river has been diverted. It is a matter of having the right sized earth moving equipment to hand to be able to divert the river
- Dr John Ward believes the best diamonds could be in the river bed, with thicker gravels. The thicker the gravels the better the collector through imbrication.

4.3 Other Geology

- the mining licence is located near the edge of the craton, which explains the high proportion of Type IIa diamonds a feature which is expected to continue
- there has been regional uplifting, leading to the expectation that there has been only limited erosion of the source pipes, of less that 10m - not 100m and more, which is commonly experienced elsewhere in Angola and Africa. This helps to explain the lack of thicker gravels. It also means the source pipes could offer better volume potential than deeply eroded pipes and improve the hard rock mine economics. (this is a change on earlier thoughts, by James Napier)
- the low energy environment, with a meandering river system, on a flat bedrock with minimal presence of boulders precludes the availability of potholes and bonanza trap sites. Diamonds are more likely to collect on crossover points along a river channel, where gravels tend to accumulate. Over time this can lead to a concentration of diamonds towards the middle of the river plain rather than the edges, though floods can disrupt the accumulation of these gravel beds
- the initial thought was that the host of the diamonds was Calonda gravels, which date back 90 mill. years. However, Dr John Ward was of the opinion that the age might be as little as 0.5 to 1 mill. years. He prefers the term Calonda-like gravels. There may be reworked Calonda gravels with the introduction of much more recent material from the initial erosion of the pipes.
- the grade of the gravels is typically 10 cphm³ on average as has been seen through the 5 month mining campaign to date
- lateritic material which have lower grades has been encountered but this is fairly limited (note, laterites can "chew" up the indicator minerals and confuse exploration)
- where you find bars occurring in a river system they can be good trap sites, but the first 25% of the bar, upstream, will hold most of the diamonds.

4.4 Kimberlite Pipe Exploration

- during the last field season nine kimberlite pipes were assessed and four returned diamonds
- E251 was tested the most extensively with 10,000 m³ taken from about half a dozen locations, to depths of 8-9m. While twelve diamonds were recovered, the grade was low (you really need to test 50-100,000 m³ to get a reliable sample volume). See photo below. Diamonds were recovered from the overlying red sand rather than the kimberlite rocks.
 - the profile went through 2-3m of sand, 1m of lateritic ferrocrete, then weathered kimberlite, reaching fresher kimberlite at 9-11m depth
- some 17" drilling was undertaken
- the aim was to test one pipe per month
- E257 went through 3.4m of sand, then 2m of kimberlite. Took two samples of 175m³ and 100 m³, recovering a 0.1 carat diamond.
- E19 was tested (?), and E170 recovered a micro diamond from a quick soil sample. A follow-up 40 t sample didn't return anything.
- generally, if you recover 5-8 mm garnets you are within 1 km of a pipe. If ilmenites are 2-4 mm in size, you are within 1 km of a kimberlite
- · Here, we are very close just have to identify which kimberlites carry the best grades
- 31 alluvial samples of approx. 250m³ have been taken with the results being published by Lucapa.
- NB: all decent kimberlites in Angola have been found from alluvial work programs
- thus the recommendation from Dr John Ward is to continue mining the alluvials, plotting the data, and this is going to be a better method of finding the pipes that are shedding the diamonds. He says there is NO QUESTION that there is an alluvial mine worth pursuing, so focus on that, and you will eventually be led to the kimberlite. As you get closer to the source you improve quantities, shapes and sizes. He thinks that current mining is within 1-2 km of a pipe, and that may be a pipe that isn't magnetic and hasn't even been identified as a possibility
- here, mining at Sector 5 in mining Block 31 has given some of the best stones. Sampling came across a kimberlite at Blk 29, but this wasn't a previously identified target from aeromag surveys. This needs more follow-up work.
- visited alluvial sampling site 6 and 19, where 95 and 32 carat diamonds were recovered. There are two or three confirmed kimberlites just 2-3 km away, offering priority targets
- important to look at tributaries coming into the river, as these points are more likely to have the bigger stones, and they could help locate the source pipes
- Block 8 a 131 carat stone and other high value diamonds recovered from there. 4-5 mm garnets, in gravels 1.3m thick. A fancy yellow and a pink stone recovered. High priority target area, but more recently 1,500 m³ mined at a grade of 7-8 cphm with the largest stone being 7 carats. This was affected by dilution from a sandy side wall, so it might not be representative. When the gravels were processed they looked more like kimberlite tails, being black in colour. This would be indicative of very high concentrations of ilmenites, which is also a positive sign. Anomaly 259 is 350m downstream. It is an unusual situation with blue water that has been stained by kimberlite rocks.
- · red sand can be used as a prospecting indicator, as it is stained from the kimberlite



Diagram 13: Garnets and ilmenites from Block 8



Diagram 14: Kimberlite rocks in E251 test pit

5.0 History

5.1 Garimpeiro

- the concession was being extensively mined prior to the illegal miners being removed from awarded concessions. The 3,000 km² concession may be exposed to garimpeiro mining elsewhere, to a limited extent, but it is too large and costly to police the distant locations on different rivers
- when garimpeiros mine the gravels they generally take about 40% of the available material. The rest gets sterilised due to waste dumps covering other areas. Thus the opportunity exists to go back into these areas with modern equipment, but it is slightly messy mining and would only be considered after virginal gravels are worked out.



Diagram 15: Area previously mined by garimpeiros

5.2 Licence History

- in the 1970s a number of kimberlites were identified, 26 by the government
- MSA did early reports there were stories of ilmenites and diamonds themselves
- concession originally granted to Nare (New Diamond Corp). When Lonro started to finance the exploration the name was changed to Lonro and following their exit, the name was later changed to Lucapa
- airborne surveys done by Fuergo initially in 2007/08
- then Lonro experienced financial difficulties and almost nothing was done for a two year period, and there was an absence of a consistent program
- the first test pits were done where garimpeiros were working, 6 km from the sealed road
- much of the early focus was on the search for kimberlite pipes rather than assessing alluvial

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