

Cyclone Zircon Project

萨克隆锆矿项目

Western Australia

西澳

Overview

概况

The Cyclone Zircon Project lies around 300km north of Eucla, 25km west from the WA / SA border on the northern margin of the Eucla Basin within the Great Victoria Desert. The project lies within the traditional lands of the Pila Nguru Spinifex People, and is held under Exploration License E69/1920, with a Mining Lease application M69/141 lodged in August 2011.

萨克隆锆矿项目位于尤克拉盆地北部约 300 公里，即大维多利亚沙漠的尤克拉盆地北部边缘的西/南澳交界处以西 25 公里。该项目位于 Pila Nguru Spinifex 土著民的土地上，其所属勘探证编号为 E69/1920，于 2011 年 8 月递交的开采证申请编号为 M69/141。

The Cyclone deposit was discovered in 2007 during reconnaissance exploration of a southwest facing elongate topographic feature with a prominent high on its southern edge, interpreted as the Tertiary Barton shoreline with a headland forming a classic J-Bay entrapment site. An extensive exploration drilling and geological investigation program has been undertaken, with a Pre-Feasibility Study (PFS) completed in March 2012 and a Definitive Feasibility Study (DFS) underway.

萨克隆矿于 2007 年在勘探一个西南朝向且南部边缘明显较高的地形特征时被发现，该地形特征被解释为带有岬角的第三纪巴顿海滨线形成一个典型的 J 型矿砂汇集地。本公司已在该地区实施了大范围的勘探钻井和地质调查项目，并于 2012 年 3 月完成了预可行性研究，最终的可行性研究也在进行。

Exploration

勘探

As the Cyclone mineralisation occurs within a preserved Tertiary (ca 35 Ma) beach shoreline environment overlain by a thin unit of Quaternary aeolian dune sands, all exploration has been completed using the NQ Air Core system of drilling.

由于萨克隆矿化发成在一个保留的第三纪（3500 万年前）海滨海岸线环境，该区域被一层薄薄的第四季风成沙所覆盖，所以全部勘探都采用了（75mm）空心钻探系统。

The Cyclone Deposit was discovered by DRX in 2007, with a widely spaced resource delineation program subsequently completed. A small program of check drilling was carried out in 2008 which highlighted that lower grade mineralisation in the weathered profile was not recognised during the 2007 drilling program. A follow-up drilling and sampling program was completed in 2009 to provide complete coverage across the mineralisation. Infill drilling was carried out in December 2010, focussing on the proposed start-up area. Additional infill drilling was carried out in 2011 in conjunction with drilling for bulk sample collection. Several small programs were completed in the second half of 2011 for infill and edge definition purposes, including southern extensions of the nearshore resource. A final program of infill drilling was completed in 2012 for edge definition of strand mineralisation and further bulk sample collection. A total of 1,379 holes for 55,834m of drilling have now been completed over the Cyclone Deposit within DRX tenure. The majority of Cyclone has been drilled at 50m hole spacing and drill lines are generally 150m apart with some lines spaced at 300-500m.

本公司在 2007 年发现了萨克隆矿，随后完成了广泛地间隔资源划分方案。一个用来检查钻孔的小项目在 2008 年实施，该项目突出了在风化剖面的低品位矿化，该矿化在 2007 年的钻探项目中没被发现。覆盖于整个矿化的跟进钻探和取样方案于 2009 年被完成。集中于拟议的启动区的加密钻探于 2010 年 11 月份进行。额外的加密钻探在 2011 年进行，并结合了大样采集钻探。几个小型钻探项目在 2011 年下半年完成，其目的是为了定义填充物和边缘，包括了近岸资源向南的延伸情况。为了海滨矿化的边沿界定和进一步的大样采集，最终的加密钻探在 2012 年完成。在本公司矿权内的萨克隆矿，至今已完成了 1379 个孔总计 55,834 米的钻探。萨克隆大部分地区被实施钻孔间隔为 50 米的钻探，并且钻探线间隔通常为 150 米（除了某些线的间隔为 300-500 米）。



All drill holes are vertical and all samples collected at 1.5m intervals. The majority of samples were collected through rotary splitter with some whole samples collected and used in bulk sample test work.

全部钻孔都是垂直的，并且全部样品都采集于 1.5 米的间隔处。大部分样品是通过旋转分离用于大样测试的完整样品来进行采集的。

The grade of heavy minerals for each sample was initially estimated by panning and visual estimation. All samples were submitted to Regional Exploration Management Pty Ltd preparation laboratory for sample preparation, drying, wet sieving at 2mm and 53 micron and later to Diamantina Laboratories for heavy mineral separation by TBE (2.92 2.96 sg).

每个样品的重矿品位通过淘选和目测被初步估算。全部的样品被提交到区域勘探管理有限公司的实验室进行样品处理、烘干、湿筛（标准为 2 毫米和 53 微米），之后再送到 Diamantina 实验室通过 TBE 法进行重矿物分离。

Mineralogical assemblage determined by QEMSCAN® (with routine XRF confirmation) over selected sample composite intervals and incorporated into the geological database.

通过在选定样本的复合区间使用“扫描电镜矿物定量评价”法（常规的光谱仪确定）决定矿物组合并纳入地质数据库。

Geology

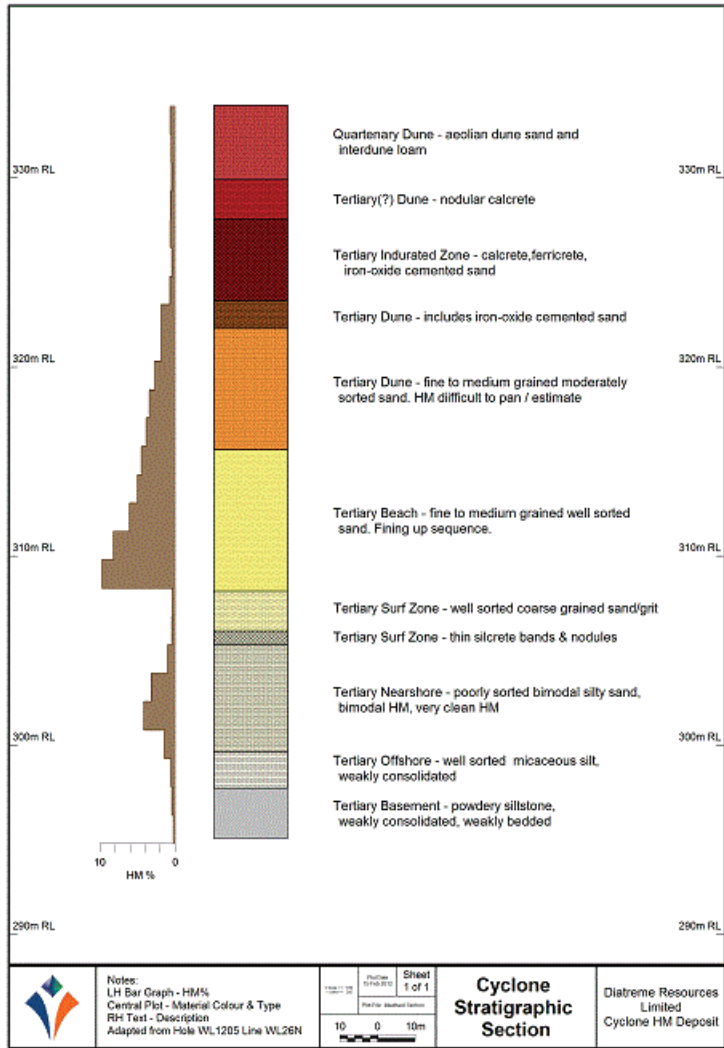
地质概况

The Cyclone Deposit is made up of a number of mineralised strand systems which are interpreted to represent Tertiary beach placer deposits with associated overlying dunal and underlying near shore deposits. Quaternary cover overlies the deposit, and a shallow weathering profile with calcrete and ferruginous induration has developed in the overburden material, with the mineralised sands being free flowing with very little induration (rock) and low slimes contents which are favourable to conventional mining techniques.

萨克隆矿由一系列矿化海滨系统组成，该系统被解释为体现了第三纪海滨砂矿沉积与相关的叠加沙丘沉积和下层近岸沉积。第四纪的覆盖物覆盖在沉积物上，带有钙结层和铁锈色硬化的浅层风化剖面发生在剥离物内，并且带有少量硬化且含泥量低的矿砂易流动，这些都有利于传统的开采技术。

Mineralisation occurs within bimodal near-shore fine sands, higher grade beach strandlines, homogenous beach sands, and overlying aeolian dune sands. A schematic stratigraphic column for Cyclone is presented below.

矿化发生在双峰近岸细沙、较高品位的沙滩海岸水线、均质的海滩砂以及叠加的风积沙丘砂内。下图为萨克隆的地层剖面图。



The mineralisation displays a very high value mineral assemblage and is dominated by zircon (31% of the HM) and a range of weathered / altered titanium bearing minerals (42% of the HM), with HiTi (70 85% TiO₂) being the most abundant. Siliceous Ti-oxides (>10% SiO₂) make up around 22% of the HM, but levels of other "trash" (i.e. low value) HM are very low.

该矿化显示出一个具有非常高价值的矿物组合，该矿化由锆精矿（占重矿的 31%）以及一系列的风化/蚀变的含钛矿物（占重矿的 42%）为主，在含钛矿物中，高钛（含 70% 和 85%的二氧化钛）最为丰富。虽然硅钛氧化物（大于 10%的二氧化硅）构成了大约 22%的重矿，但是其他“垃圾”（低价值的）重矿含量非常低。

Mineral Resource

矿产资源

The Cyclone Mineral Resource is reported as 137 Mt at 2.2% HM, containing 3.0 Mt of HM (see [ASX release 9 Jan 2014](#)). More than 90% of the resource is classified as Measured.

据报道，萨克隆矿产资源为一亿三千七百万吨品位为 2.2%的重矿，包含了三百万吨重矿（参照 2014 年 1 月 9 日澳洲证券交易所的披露）。超过 90%的资源被归类为探明的。

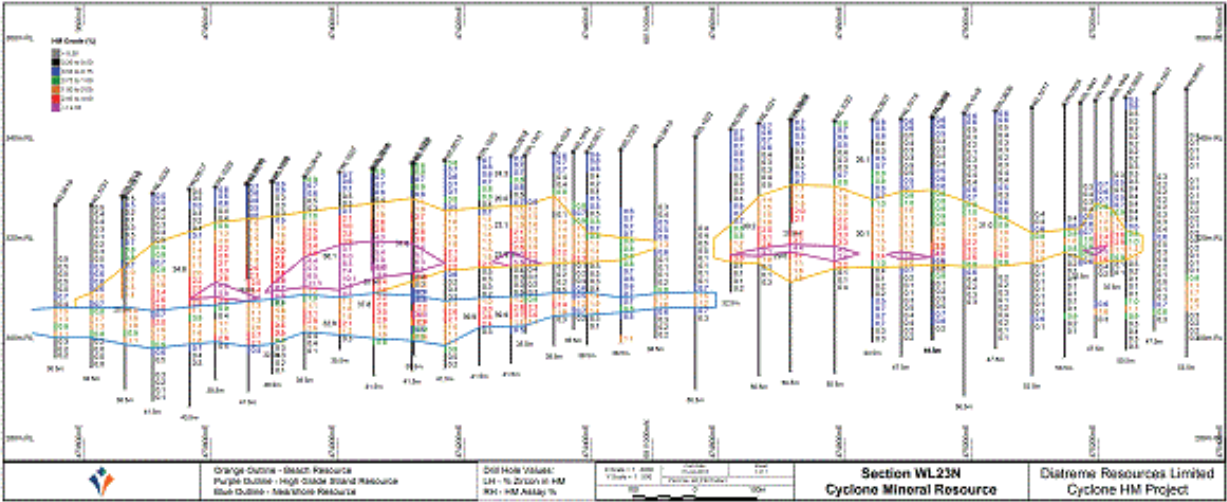
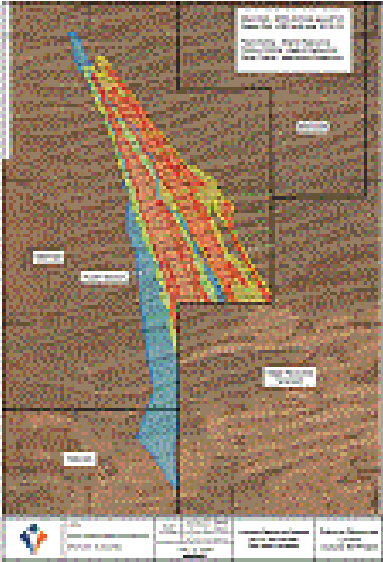
| Category | HM cut-off % | Material Mt | HM % | HM Mt | Slime % | OS % | Head Grade | | | | | | Zircon Kt |
|---|--------------|-------------|------|-------|---------|------|------------|----------|--------|--------|-----------|-----------|-----------|
| | | | | | | | Zircon % | Rutile % | Leuc % | HiTi % | Alt Ilm % | Si TiOx % | |
| MEASURED | 2.0 | 48 | 3.5 | 1.68 | 3.6 | 3.8 | 1.12 | 0.11 | 0.24 | 0.75 | 0.35 | 0.79 | 534 |
| MEASURED | 1.5 | 76 | 2.8 | 2.16 | 3.9 | 4.6 | 0.90 | 0.09 | 0.19 | 0.62 | 0.29 | 0.64 | 681 |
| MEASURED | 1.0 | 118 | 2.3 | 2.69 | 4.1 | 5.4 | 0.71 | 0.07 | 0.15 | 0.49 | 0.24 | 0.51 | 842 |
| INDICATED | 2.0 | 2 | 2.9 | 0.04 | 3.2 | 5.6 | 0.82 | 0.09 | 0.16 | 0.82 | 0.25 | 0.56 | 12 |
| INDICATED | 1.5 | 6 | 2.0 | 0.11 | 3.5 | 7.2 | 0.56 | 0.06 | 0.07 | 0.61 | 0.12 | 0.39 | 31 |
| INDICATED | 1.0 | 19 | 1.5 | 0.28 | 3.3 | 5.0 | 0.38 | 0.05 | 0.04 | 0.49 | 0.07 | 0.28 | 73 |
| TOTAL | 2.0 | 50 | 3.5 | 1.73 | 3.6 | 3.8 | 1.10 | 0.11 | 0.24 | 0.76 | 0.35 | 0.79 | 546 |
| TOTAL | 1.5 | 81 | 2.8 | 2.28 | 3.8 | 4.8 | 0.88 | 0.09 | 0.18 | 0.62 | 0.28 | 0.62 | 713 |
| TOTAL | 1.0 | 137 | 2.2 | 2.97 | 4.0 | 5.4 | 0.67 | 0.07 | 0.14 | 0.49 | 0.21 | 0.47 | 914 |
| Mineral Assemblage | | | | | | | 31% | 3% | 6% | 23% | 10% | 22% | |
| CYCLONE RESOURCE ESTIMATE BY MINERALISATION DOMAIN | | | | | | | | | | | | | |
| Category | HM cut-off % | Material Mt | HM % | HM Mt | Slime % | OS % | Head Grade | | | | | | Zircon Kt |
| | | | | | | | Zircon % | Rutile % | Leuc % | HiTi % | Alt Ilm % | Si TiOx % | |
| STRAND DOMAIN | | | | | | | | | | | | | |
| MEASURED | 1.0 | 13 | 6.0 | 0.78 | 2.7 | 2.2 | 1.90 | 0.18 | 0.41 | 1.31 | 0.57 | 1.42 | 246 |
| INDICATED | 1.0 | 0 | 6.0 | 0.01 | 2.3 | 1.6 | 1.54 | 0.19 | 0.43 | 1.28 | 0.75 | 1.13 | 4 |
| TOTAL | 1.0 | 13 | 6.0 | 0.79 | 2.7 | 2.2 | 1.89 | 0.18 | 0.41 | 1.31 | 0.58 | 1.41 | 250 |
| Mineral Assemblage | | | | | | | 31% | 3% | 7% | 22% | 10% | 23% | |
| BEACH DOMAIN | | | | | | | | | | | | | |
| MEASURED | 1.0 | 80 | 1.9 | 1.51 | 4.2 | 5.3 | 0.58 | 0.06 | 0.14 | 0.38 | 0.23 | 0.41 | 466 |
| INDICATED | 1.0 | 2 | 1.7 | 0.03 | 3.4 | 5.5 | 0.52 | 0.07 | 0.15 | 0.34 | 0.18 | 0.36 | 8 |
| TOTAL | 1.0 | 82 | 1.9 | 1.54 | 4.2 | 5.3 | 0.58 | 0.06 | 0.14 | 0.38 | 0.23 | 0.41 | 474 |
| Mineral Assemblage | | | | | | | 31% | 3% | 7% | 20% | 12% | 22% | |
| NEARSHORE DOMAIN | | | | | | | | | | | | | |
| MEASURED | 1.0 | 25 | 1.6 | 0.40 | 4.5 | 7.5 | 0.52 | 0.06 | 0.05 | 0.42 | 0.08 | 0.35 | 130 |
| INDICATED | 1.0 | 17 | 1.4 | 0.24 | 3.3 | 4.9 | 0.36 | 0.05 | 0.03 | 0.49 | 0.05 | 0.26 | 61 |
| TOTAL | 1.0 | 42 | 1.5 | 0.64 | 4.0 | 6.4 | 0.45 | 0.05 | 0.04 | 0.45 | 0.06 | 0.32 | 191 |
| Mineral Assemblage | | | | | | | 30% | 3% | 3% | 29% | 4% | 21% | |

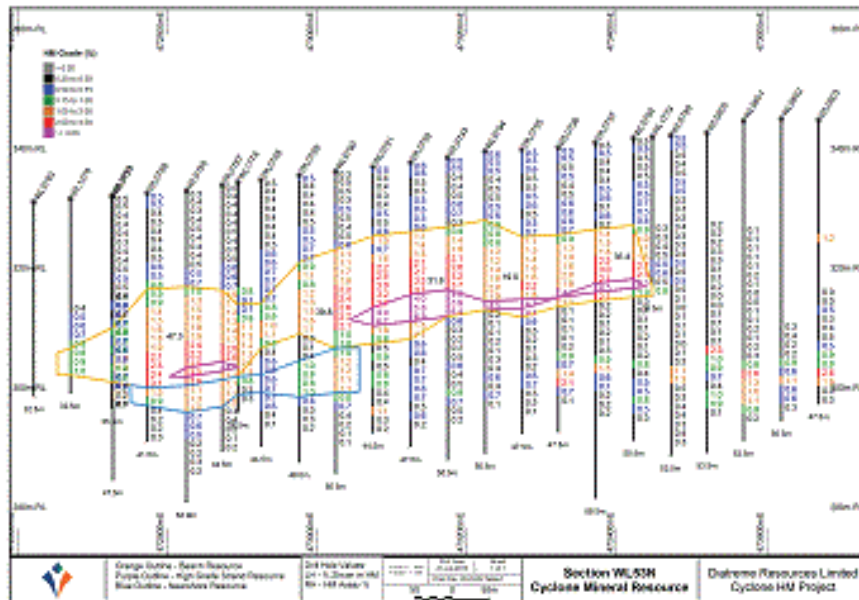
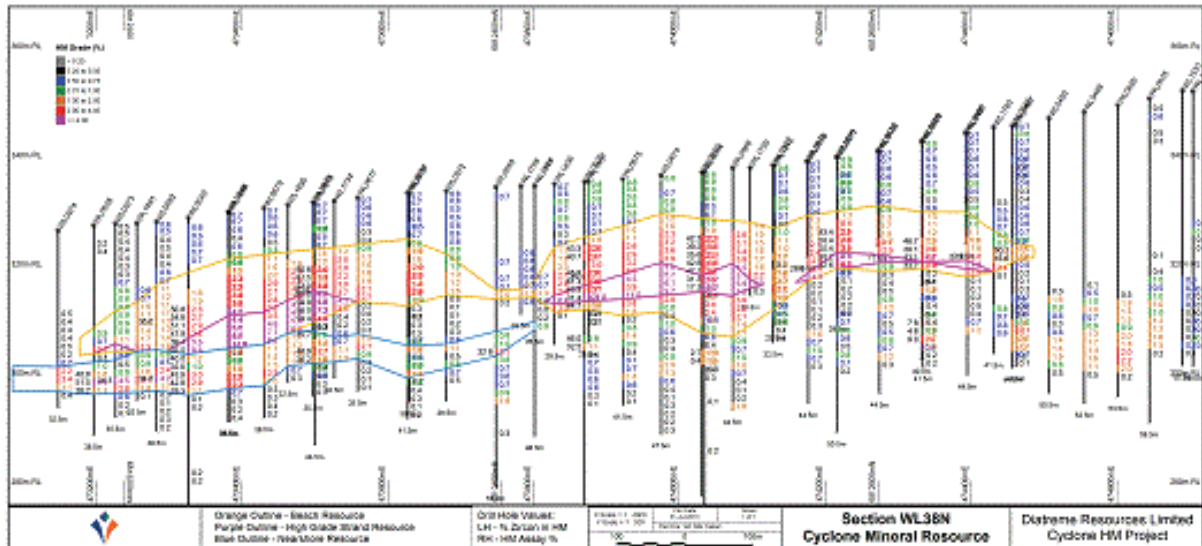
The estimate highlights the low levels of slimes (-53um) at 4.0% and oversize (>2mm) at 5.4% within the Cyclone mineralisation, both characteristics are conducive to simple and efficient (i.e. low cost) mining, processing and tailing operations.

该估计突出了萨克隆矿含 4.0% 的小号矿泥（小于 53 微米）和 5.4% 的（>2 毫米）大号矿泥，它们的特性都有利于简单有效的（即低成本）开采、加工及尾矿处理。

For the resource estimate the mineralisation at Cyclone was modelled using three separate, but adjoining, geological domains "Beach", "Strand" and "Nearshore". Although these domains display some distinctive geological characteristics, they are expected to be extracted as a combined body of mineralisation. Refer to diagrams below for plan and section views of the Cyclone Mineral Resource.

为了资源评估，萨克隆的矿化用三个单独的但是毗邻的地质域（“海滩”、“海滨”、“近滨”）进行建模。虽然这些领域表现出一些独特的地质特征，但是它们预计将被作为一个矿化的组合体进行开采。参考下面几幅萨克隆矿的平面和剖面视图。





Metallurgy

冶金

The Company's primary objectives in undertaking metallurgical test work were to:

本公司正在进行的冶金测试工作的主要目标包括：

1. Produce a very high grade Heavy Mineral ("HM") concentrate through a wet concentrator process (WCP).
通过湿选法生产出高品位的重精矿。
2. Maximise the recovery of Zircon (the major valuable mineral component of the Cyclone Resource), and
最大化锆石的回收（萨克隆资源中主要有价值的成分）。
3. Develop process flowsheets to be used in engineering designs for the wet and dry HM processing plants (WCP and MSP).
开发可用于湿选矿厂和干选矿厂工程设计的工艺流程。（湿选厂和选矿厂）

Testwork on a seven (7) tonne bulk sample composited from drilling throughout the Cyclone Resource was conducted by the company, CPG Resources Mineral Technologies, during 2011. Key outcomes from the metallurgical testing included:

由遍及萨克隆矿的钻探所组成的 7 吨大样在 2011 年由 CPG 资源矿物技术公司进行测验。冶金测试的主要结果包括:

- The wet concentrator testwork produced a high grade HM concentrate (97.8% HM) utilizing conventional mineral sand separation technology.
- 湿选法测试采用了传统的矿砂分离技术生产出高品位的重精矿（97.8%的重矿）。
- The estimated distribution of zircon from the bulk sample to the WCP HMC is 95.3%.
- 从大样到湿选厂的重精矿中锆石的预计分布情况为 95.3%。
- The estimated distribution of zircon from the HMC to the MSP final Zircon product is 85.0%.
- 从重精矿到选矿厂的最终锆产品的锆石预计分布情况为 85%。
- A mineral separation process was designed to produce Zircon and two titanium products, HiTi87 (86.6% TiO₂) and HiTi67 (67.3% TiO₂).
- 本公司设计了一个用于生产锆石和两种高钛产品 HiTi87(含 86.6%的二氧化钛)和 HiTi67(含 67.3%的二氧化钛)的选矿过程。
- The testwork identified that conventional "off the shelf" technology can be used in the mineral processing at Cyclone.
- 该测试确认传统的现成技术可以被用于萨克隆矿的选矿加工。
- Refer to **ASX Release 30 Jan 2012** for further details.
- 详情请参考 2012 年 1 月 30 日的澳大利亚证券交易所披露。

Testwork on a twelve (12) tonne bulk sample composited from drilling within the first two years of the proposed Cyclone mine path was conducted by CPG Resources - Mineral Technologies during 2012/13. This work generated results that generally confirmed the outcomes of the 2011 program, with minor variations and additions to the processing flowsheet undertaken to optimise the mineral product recovery and quality.

来自萨克隆矿的 12 吨大样在 2012/2013 年由 CPG 资源矿物技术公司进行测验，这些大样是由头两年在萨克隆拟定开采路径的钻探物混合而成。这项工作产生的结果大体上确定了 2011 年的项目结果，并以相对于工艺流程较小的偏差及附加，最大化了矿产品的回收和品质。

Ore Reserve

矿石储量

Diatreme Resources Limited announced an ore reserve estimate for the Cyclone Zircon project in February 2012 following an extensive resource drilling program at Cyclone, metallurgical testwork and process flowsheet development by CPG Resources Mineral Technologies, open pit design, and capital and operating cost estimates completed as part of the Prefeasibility Study.

大川资源有限公司在 2012 年 2 月公布了一份针对于萨克隆锆矿项目的矿石储备预测，该预测是随着作为预可行性研究部分的大范围勘探项目、冶金测试、露天采场设计以及资本和运营成本的估算被完成后得出的。

The Cyclone PFS pit design contains a Probable Ore Reserve of 97 million tonnes (Mt) at 2.5% HM, including 0.79% Zircon, containing 2.4Mt HM, including 770kt of Zircon. The Ore Reserve is sufficient for 9.7 years of operations at the planned 10Mtpa mining rate. With a life of mine strip ratio of 1.1:1, low clay content, and the free dig nature of the ore, a relatively low operating cash cost is anticipated.

萨克隆项目预可行性研究中的采场设计包含概略矿石储量为 9700 万吨品位为 2.5%的重矿，其中包括 0.79%的锆矿，即 240 万吨的重矿，以及 77 万吨锆矿。以预计每年 100 万吨的开采速率，这个储备足够开采 9.7 年。由于矿石剥离率为 1.1:1，黏土含量较低以及该矿容易挖掘的性质，我们预期运营现金成本相对较低。

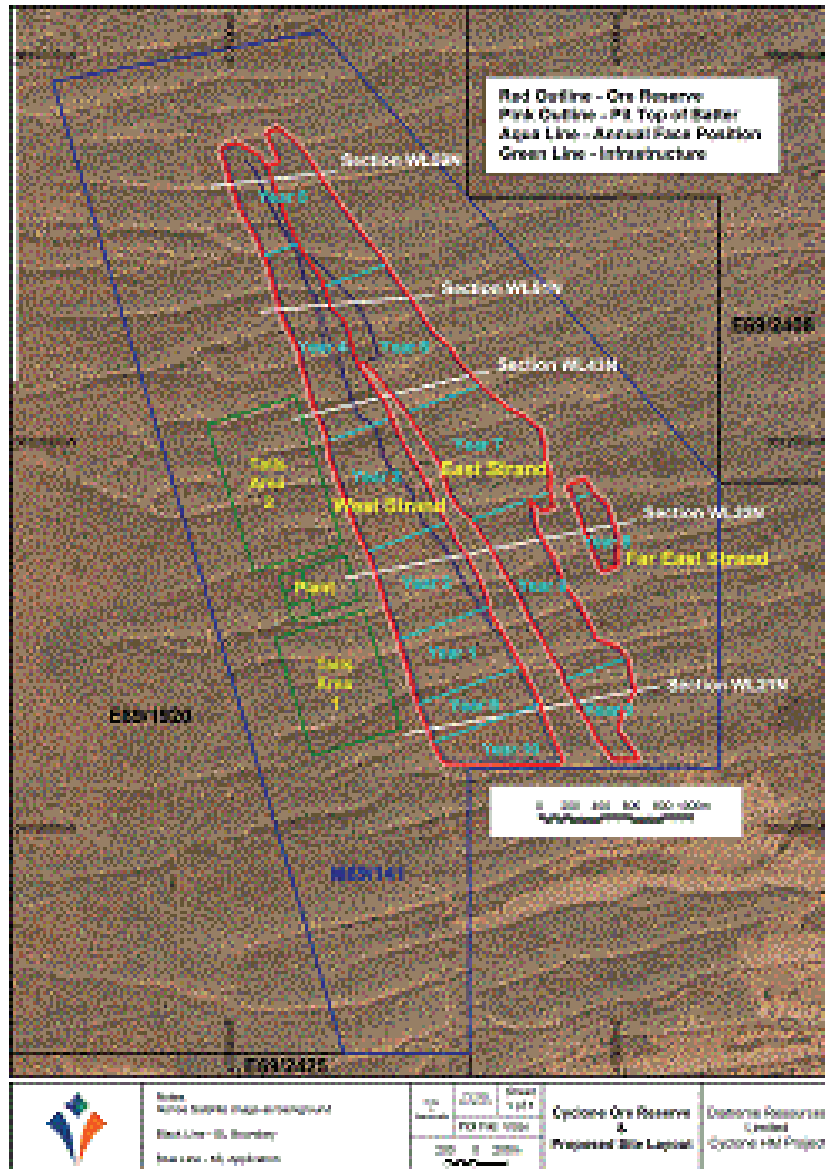
| PROBABLE ORE RESERVE | | | | | | | | | | | | |
|----------------------|------|-------|---------|------|------------|----------|--------|--------|-----------|-----------|-----------|--|
| Material Mt | HM % | HM Mt | Slime % | OS % | Head Grade | | | | | | Zircon Kt | |
| | | | | | Zircon % | Rutile % | Leuc % | HiTi % | Alt Ilm % | Si TiOx % | | |
| 97 | 2.5 | 2.41 | 4.0 | 5.1 | 0.79 | 0.08 | 0.17 | 0.52 | 0.26 | 0.56 | 770 | |
| Mineral Assemblage | | | | | 32% | 3% | 7% | 21% | 10% | 23% | | |

The Ore Reserve is classified as Probable to reflect the preliminary nature of some parameters relating to mine planning and mineral processing.

矿石储量被分类为“概略的”用来反映一些参数的初始性质，这些参数与矿山规划和选矿相关。

The Ore Reserve represents a 70% conversion from the Mineral Resource estimate.

该矿石储量代表了从矿产资源量估计 70% 的转换。



PFS Summary

预可行性研究总结

A preliminary mine plan has been developed for the Cyclone Prefeasibility Study ("PFS"). Capital and operating costs associated with the mine plan, mineral processing, infrastructure, logistics, personnel, permitting, royalties, and corporate overheads have been included in the PFS financial studies. Studies to date have concluded that the Cyclone Deposit could be developed as a viable mining operation. Market studies have provided forecast product pricing for revenue estimates. Costs for water supply to the mine and finalising the transport route are the risks with the greatest potential impact on the financial results.

本公司已经制定出萨克隆项目预可行性研究的初步开采计划。伴随着开采计划，选矿、基础建设、物流、人员安排、许可证、特许权使用费和公司日常开支所产生的资本和运营成本已经被包含在预可行性研究的财务报告内。迄今为止的研究断定萨克隆矿可被开发成一个切实可行的采矿作业。市场调查为收入预算提供了预计产品报价。采矿所需的水供应成本和运输路线的确定是会对财务结算产生最大潜在影响的风险。

The Prefeasibility study shows potential for the Cyclone Zircon Project to mine ore at a rate of 10 million tonnes per annum for 10 years, yielding approximately 147,000 tonnes per annum heavy mineral concentrate. Key parameters from the PFS include:

预可行性研究表明萨克隆锆矿项目以每年 100 万吨的速率可以开采 10 年的潜力，每年大约能生产 14.7 万吨重精矿。预可行性报告中的关键参数包括：

- Capital investment of \$223 million, with average annual sales revenue of \$191 million and annual NPAT of \$78 million.
- 2.23 亿澳元的资本投资，平均年销售收入为 1.91 亿澳元，年税后净利润为 7800 万澳元。
- Net present value of \$194 million and internal rate of return of 32%, with payback period of 2.1 years.
- 净现值为1.94亿澳元，内部报酬率为32%，投资回收期为2.1年
- Strong fundamentals for main mine products of zircon (66% ZrO₂) and titanium products HiTi87 (86.6% TiO₂) and HiTi67 (67.3% TiO₂), with forecast constrained global supply.
- 由锆精矿（66%的二氧化锆）和两种高钛产品：HiTi87(86.6%的二氧化钛)以及 HiTi67(67.3%的二氧化钛)组成的主要矿产品具有强健的市场基础，并预测全球供应量有限。

MINING

采矿

The area planned to be mined is lightly vegetated and diesel powered earthmoving equipment will be used to clear the vegetation prior to mining. Bulldozers will then push topsoil into stockpiles which will be loaded into trucks by an excavator for transport from the mining area to the rehabilitation area. Overburden will be removed by excavator and trucks to expose the high grade ore zone for mining. The average overburden to ore ratio is 1.13 to 1 and the equipment selected has the capability for excavating the expected zones of indurated overburden.

计划开采的区域有轻微的植被覆盖，在开采之前我们将采用柴油发动的土方设备进行清理。推土机随后将把表土推成贮存堆，然后用挖掘机将这些土装载到卡车里，并从开采区运到回填区。覆盖层将被挖掘机和卡车移开以暴露出适合开采的高品位矿区。平均的覆盖层与矿石比为 1.13:1，所选的设备拥有足够的能力挖掘出带有硬化覆盖的期望区域。

A bulldozer and dozer trap method will be used to mine the ore. There will be two separate 650 tonnes per hour (tph) mining units at different face locations to ensure blending of higher and lower grade ore to produce a controlled grade to the Wet Concentrator Plant ("WCP"). Bulldozers will push ore for a distance up to 100m into the traps which will convey the ore at a consistent feed rate to a screener and slurry bin. The screen will remove coarse particles larger than 3mm from the ore and water will be mixed with the finer particles to form a slurry. Slurry pumps will pump the screened ore from the slurry bin to a surge bin at the WCP. The mining rate will be 1,300 tph for 7,700 hours per year giving an annual mining rate of 10 million tonnes.

推土机和收集箱相结合的方法将被用于采矿。将有两个独立的开采单位以每小时 650 吨的速率在不同朝向的位置作业，确保将较高品位和较低品位的矿石混合以生产出湿选厂可控的矿石品位。推土机将把矿推送多达一百米到收集箱里，收集箱把矿以固定的进料速度传送到筛分机和泥浆仓。筛分机将会从矿中移除大于 3 毫米的粗粒，然后用水与细微颗粒混合形成泥浆。泥浆泵将会从泥浆仓输送筛选过的矿到湿选厂的储料仓。开采率为每小时 1300 吨，每年开采 7700 个小时，总计年采矿速率为 1 千万吨。

The water supply for the project has not been finalised and hydrogeological studies are continuing to evaluate alternatives. Water supply for the project is expected to be sourced from a deep aquifer in the Officer Basin, a large sedimentary basin underlying the project area. A high quality aquifer, known to exist in two test wells drilled by another company 80km to the east of Cyclone, is expected to extend westward beneath Cyclone. A reliable supply of 250 litres per second from bores will be required for the mine, supporting infrastructure, and mine village. The PFS has identified water supply as a risk which will not be adequately mitigated until a water bore is drilled and tested.

该项目的水供应还未敲定，同时水文地质学研究仍在继续评估方案。该项目的水供应预期来源于一个位于 Officer 盆地的深层含水层，该盆地是一个位于项目区域下面的大型沉积型盆地。一个高品质的蓄水层已知存在于在另一家公司钻探的两个勘探井中，其位于萨克隆矿 80 公里以东，该蓄水层被预期向西延伸到萨克隆矿下方。为了满足开采、基建和矿山营地的用水需求，我们需要每秒 250 升水的可靠供应。预可行性研究认为水供给是一个只有当水孔被钻探和测试后才能被充分缓解的风险。

PROCESSING

选矿

The WCP has been designed by CPG - Mineral Technologies ("CPG") based on metallurgical testwork completed on a seven (7) tonne bulk sample. The bulk sample was collected from holes drilled across the entire Ore Reserve to produce a representative sample. The WCP will be located on the western side of the mine and one kilometre north of the initial mining area. This WCP location will be fixed for the life of the mine and has been selected to ensure the pumping distances for both feed and tailings are not excessive. Tailings storage facilities will be located north and south of the WCP to provide short tailings pumping distances during the early years of the mine. The WCP process will be a totally wet slurry process and will include screening and several stages of gravity separation including spirals, classifier, and shaking tables to concentrate the valuable heavy minerals.

基于 7 吨大样的冶金测试结果，湿选厂已由 CPG 资源矿物技术公司设计。这些大样是从遍布整个矿山的钻孔中搜集而产生的具有代表性的样品。湿选厂将位于矿井西面，在初始矿区以北 1 千米处。在矿井的生命周期内，该湿选厂的位置将会在固定的地点，该地点确保进料和处理尾渣的输送距离不会过远。尾矿存储设施位于湿选厂的南边和北边，以在该矿的早些年提供较短的尾渣输送距离。湿选厂的工艺流程是完全的湿浆工艺，将包括筛选和几个阶段的重选（即旋流器、分级机和摇床）来精选有价值的重矿。

The majority of silica minerals, low grade titanium minerals, and trash minerals will be rejected to tailings from the WCP. A high grade mineral concentrate (98% HM) will be produced containing zircon and valuable titanium minerals. Metallurgical testwork has demonstrated good recovery of zircon in a conventional gravity separation process. The average rate of HM concentrate (HMC) production from the WCP is estimated to be 25 tph.

大部分的硅氧矿物、低品位的钛矿物和杂质矿物将从湿选厂被弃除为尾渣。含有锆精矿和有价值钛矿的高品位精矿（98%的重矿）将被生产。冶金测试表明在传统重力分离过程中锆石的回收情况良好。该湿选厂的重精矿平均生产速率预计为每小时 25 吨。

The sample used for flowsheet development testwork did not need to be deslimed due to the low level of slimes in the orebody. The low grade non-valuable titanium minerals were not recovered and generally reported to the tailings. These minerals are not included as products in this evaluation but do have potential for recovery if they can be demonstrated to show economic potential in the future. The ore contains approximately 4% slimes which is relatively low and provides confidence that tailings management will be a conventional procedure. A thickener has been included in the process for water conservation and tailings control. Normal rehabilitation procedures will be applied to a stable sand tailings surface.

由于矿体的含泥量低，用于流程开发测试的样品不需要脱泥。低品位无价值的钛矿物没被回收并且通常被报告到尾矿里。这些矿物未被列为该评估里的产品，但它们拥有被回收的潜力，如果将来它们可被证明拥有经济潜力。该矿含有大约 4%的矿泥，该比率是相当低的并为常规程序的尾矿管理提供了信心。浓缩机被包括在节约用水和尾矿处理的过程中。正常的复原程序将会被应用于稳固的尾砂表层。

TRANSPORT

运输

The WCP will produce a moist HM concentrate that will be loaded into trucks for transport by road to an existing rail siding on the Trans Australian Rail Line. The mine and WCP will be located 220km north of the rail line and current planning assumes a road licence can be obtained for the preferred route through a nature reserve. Contingency planning has identified two alternative routes including a longer route around the nature reserve.

湿选厂将生产潮湿的重精矿，然后由卡车运输到一条现有的澳大利亚铁路（the Trans Australian Rail Line）支线。矿山和湿选厂位于该铁路线以北 220 公里处，当前规划过程假定本公司能够取得穿过自然保护区的首选路线的道路许可。应急计划确定了两条备选路线，包括了一条较长的环绕保护区的路线。

The trucks will dump the concentrate on a stockpile at the siding and a front end loader will load the concentrate into containers for rail transport. A rail service provider has provided budget pricing for several options to transport the concentrate in containers or in bulk to ports in WA and SA. The current preferred option is rail transport in containers from Forrest to Port Adelaide.

卡车将重精矿倾倒在支线的贮存仓里，一台前端装载机将把这些重精矿装载到用于铁路运输的集装箱中。铁路服务供应商已经提供了几个可供选择的将精矿以集装箱或散装的形式运输到西澳、南澳码头的预算定价。目前首选是从弗里斯特到阿德莱德港的集装箱铁路运输。

MINERAL SEPARATION PROCESS

选矿过程

A Mineral Separation Plant ("MSP") will be constructed in Australia or China close to an existing port. CPG has designed the MSP from testwork on the HM concentrate sample that was produced during testwork for development of the WCP flowsheet. The MSP includes a Hot Acid Leach ("HAL") process to clean surface coatings from the non-conductor mineral grains for improved mineral separation and product quality.

选矿厂将被建在澳大利亚或者中国靠近现有港口的地方。在测试重精矿样品（产于湿选厂工艺流程开发的测试中）时，CPG 公司已经设计出选矿厂。该选矿厂包括了热酸浸出过程，用以清除非导体矿物颗粒表面用以提高矿物分选和产品品质的镀膜。

Electrostatic and magnetic separation processes were used to produce a HiTi87 product (87% TiO₂) and a HiTi67 product (67% TiO₂). The non-conductor stream from the feed was subjected to HAL treatment, wet gravity separation, electrostatic and magnetic separation to produce a Zircon product.

电磁分离法被用于生产两种高钛产品：HiTi87(含 87%的二氧化钛)和 HiTi67(含 67%的二氧化钛)。来自于进料的非导体流通过热酸浸出、湿重力分离以及电磁分离后生产出锆精矿产品。

MINERAL PRODUCTION

矿产开发

The metallurgical testwork reports by CPG provide estimates for recovery of minerals from the bulk sample to the three mineral products. The production estimate for zircon is obtained by applying a recovery factor to the zircon reserve, and production estimates for the two HiTi products use recovery factors applied to several titanium minerals in the Ore Reserve as shown in the following table.

来自于 CPG 的冶金测试报告提供了关于从大样到三种矿产品的矿石回收预测。锆精矿的产量预测通过锆石储量的回收系数得出，而两种高钛产品的产量预测则采用了下表所示的几种含钛矿物的回收系数得出。

| PRODUCTS | ORE RESERVE MINERALS – Recovery Factor % | | | | | |
|----------|--|--------|-----------|------|------------------|---------|
| | Zircon | Rutile | Leucoxene | HiTi | Altered Ilmenite | Si TiOx |
| Zircon | 81.8 | - | - | - | - | - |
| HiTi87 | - | 66.8 | 13.4 | 1.0 | - | 2.6 |
| HiTi67 | - | - | 15.0 | 19.4 | 61.7 | 30.7 |

Annual mineral production estimates for the project include 65,000 tonnes of zircon, 10,000 tonnes of HiTi 87, and 46,000 tonnes of HiTi67. Market studies have provided estimated values for these mineral products for use in financial modelling.

项目年矿产量预计包括 6.5 万吨锆精矿、1 万吨 HiTi87 和 4.6 万吨 HiTi67。市场研究提供了这些矿产品的预计价值以用于财务模型中。

FINANCIAL EVALUATION

财务评估

PFS studies to date have developed capital and operating cost estimates for financial modelling. CPG has completed PFS quality design for the WCP and MSP including capital and operating cost estimates for these two processing plants to an accuracy of +/-25%. Mining and transportation costs are based on contractor budget estimates. Other less significant costs are based on vendor estimates. Market studies and discussions with mineral product end users have provided forecast product pricing for revenue estimates.

迄今为止预可行性研究已经得出用于财务模型的资本和运营成本估算。CPG 公司已经完成了预可行性研究湿选厂和选矿厂的品质设计，包括了这两个选矿厂的资本和运营成本估算，准确率为 +/-25%。开采和运输成本基于承包商的概算。其他较不重要的成本基于供应商估算。对矿产品最终用户的市场研究和讨论为收入预算提供了预测产品定价。

Cyclone has a capital investment of \$223 million, with average annual sales revenue of \$191 million and annual NPAT of \$78 million.

萨克隆矿资本投资为 2.23 亿澳元，品均年销售收入为 1.91 亿澳元，年税后净利润为 7800 万澳元。

The Cyclone Project has a net present value of \$194 million and internal rate of return of 32%, with a payback period of 2.1 years.

萨克隆矿的净现值为 1.94 亿澳元，内部收益率为 32%，投资回收期为 2.1 年。

Environmental Studies

环境研究

An Environmental Scoping Document has been issued by the EPA and Level 2 environmental (flora and fauna) studies have commenced over the general Cyclone mine area and proposed access road to Forrest. In conjunction with the 2012 Level 1 study, these studies form part of the formal process requirements for the issuance of a Public Environment Report (PER), expected in mid to late-2014.

环保局已发布了一份环境文件，且二级环境（动植物）研究也在萨克隆矿区和拟议到弗里斯特的道路上展开。结合 2012 年的一级调查，这些调查构成了发行公共环境报告（预计在 2014 年中后期完成）的正式流程所要求的组成部分。

Between September and November 2013 experienced zoologists from Outback Ecology, a division of MWH Australia Pty Ltd, designed and conducted field surveys for terrestrial fauna in the Cyclone project area. The surveys were designed in close consultation with assessors and scientists from the WA Office of the Environmental Protection Authority and the WA Department of Parks and Wildlife. Traditional owner representatives from the Pila Nguru were also involved in the planning and conduct of the surveys. Several fauna habitat types were identified, over 140 species of vertebrate fauna were identified and several invertebrate specimens were collected for laboratory-based identification. Assessment of the field survey dataset is ongoing. Outback Ecology and the Company continue to liaise closely with relevant stakeholders to ensure that terrestrial fauna survey work for the project is robust and comprehensive.

在 2013 年 9 月和 11 月期间，有经验的动物学家（来自 MWH 澳大利亚有限公司的 Outback Ecology 部门）在萨克隆矿区设计并实施了关于陆地生物的野外调查。这些研究是在咨询了来自西澳环保局以及西澳园区和野生动物部门的评审员和科学家之后设计出来的。来自 Pila Nguru 的土地传统拥有者代表也参与了调查的计划和实施。调查鉴定了几种动物栖息地类型，鉴定了超过 140 种脊椎动物并搜集了几种无脊椎动物的标本用于实验室鉴定。野外调查数据集的评估正在进行。Outback Ecology 和本公司持续与相关利益群体保持紧密联系以确保该项目的陆地生物调查工作是有力且全面的。

During October 2013 a vegetation survey over the proposed Cyclone mining area and haul route to Forrest on the transcontinental rail line was performed. The consultant team surveyed over 30 vegetation associations over two bioregions (and three sub regions).

在 2013 年 10 月份，在拟定的萨克隆矿区以及从萨克隆到弗里斯特的运输路线上实施了植被研究。顾问团队调查了遍布两个生物区（以及 3 个子区域）超过 30 种的植被群落。

The baseline soil assessment and waste (overburden) characterisation program for the Cyclone Project was also undertaken during this period and involved a site based soil survey and sampling program, identification of drill samples for assessment of mine waste characteristics and laboratory analysis of the physical and chemical properties of collected samples. The objectives of the work program have been to assess the characteristics and suitability of topsoil, subsoil and waste material resources within the project area for use as a rehabilitation resource, to identify any potentially problematic soil and mine waste materials, and to facilitate recommendations for soil stripping, handling and stockpiling, soil profile reconstruction and associated rehabilitation / mine closure parameters.

萨克隆项目基线土壤评估和废料（覆盖层）特性项目也在这段时间被实施，涉及了基于矿点的土壤研究和取样项目、用于评估矿山废料特征的钻探样本鉴定以及关于所搜集样本物理化学性质的实验室分析。这些工作的目的是为了评估在项目区内用于复原所使用的表土、底土和废料的特点和适用性，鉴定任何潜在的有问题土壤和矿井废料，并促进关于土壤剥离、处理和积存，土壤剖面重构以及相关的复原/矿井关闭的参数建议。

Water Supply

水供应

An investigation production water bore, "Cyclone #1", was drilled in December 2013, resulting in the successful discovery of excellent deep water flows. A series of high yielding sandstone aquifers were encountered within Cyclone #1 between 530 and 812 metres. The main aquifer commencing at 530 metres is sub artesian with its pressure surface at around 87 metres below ground level. A 12 hour airlift test yielded a water flow estimated to be 40 litres per second.

一个调查生产水孔（萨克隆 1 号）在 2013 年 12 月被钻探，结果成功发现了优良的深水流。在萨克隆 1 号水孔的 530 米到 812 米之间遇到了一系列高产砂岩含水层。始于 530 米处的主要含水层是子承压型，它的压力面在地下约 87 米处。一个 12 小时的空运试验产生了预计每秒 40 升的水流。

Field water quality tests indicate the salinity of the groundwater from the main aquifers is around 22,000 milligrams per litre total dissolved salts i.e. approximately two thirds the salinity of sea water. Following

completion of development of the bore, the field conductivity was 33,150 uS/cm at the end of 12 hour airlift testing.

矿区水质测试表明主含水层地下水的含盐量约为 2.2 万毫克溶解性盐每升，即约为 2/3 海水的浓度，随着钻孔开发的完成，在 12 小时的空运测试末的场导电率为 33,150 微西（门子）/每厘米。

Pump tests will be required to establish the long term maximum sustainable bore yield, pump settings, the hydraulic characteristics of the aquifers and siting of future mine water production bores.

需要进行泵测试以确定长期最大持续产量、泵机械设定、含水层的水利特性和未来出水孔的位置。

Based on extrapolation of data from distant oil exploration bores in the Officer Basin approximately 80 kilometres to the east, interpretation of regional geology by the Western Australia Department Industry and Resources and Geoscience Australia, the aquifers encountered in Cyclone #1 are part of an extensive aquifer system.

基于来自 Officer 盆地（大约 80 公里以东）的石油勘探孔的外部数据-- 来自 the Western Australia Department Industry and Resources and Geoscience Australia（机构名）的区域地质学解释，在萨克隆 1 号孔遇到的含水层是广泛含水层系统的一部分。