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Our Ref: 61-0780 30 September 2010
Your Ref: Project IRC

The Directors
IRC Limited
11 Grosvenor Place
London
SW1X 7HH

Dear Sirs

IRC Limited — Competent Person's Report ("CPR")

Wardell Armstrong International Ltd. ("WAI"), as part of the Wardell Armstrong Group, submits this Competent Person's Report ("CPR") on the Independent Technical Review of the Iron Ore Assets of IRC Limited and its subsidiary companies ("IRC" or the "IRC Group", as applicable) within the Amur Region and EAO Region of the Russian Federation. The address for WAI is noted above. This letter forms part of the CPR, dated 30 September 2010.

The CPR covers five iron ore projects at varying stages of development: Kuranakh, Kimkan & Sutara, Garinskoye & Garinskoye Flanks, Kostenginskoye and Bolshoi Seym.

The mining licences for the Kuranakh, Kimkan & Sutara and Kostenginskoye projects are all wholly owned by IRC. The mining licences for the Garinskoye and Garinskoye Flanks deposits are held by LLC GMMC in which IRC has a 99.58% interest, and the mining licence for the Bolshoi Seym deposit is held by LLC Uralmining ("Uralmining"), in which IRC has a 49% interest and LLC Management Company "Intergeo" has the other 51% interest.

These mining properties constitute the primary iron ore assets owned by IRC. Representatives of the WAI project team visited the Kuranakh Project and Kimkan & Sutara in February 2010. Garinskoye was previously visited in November 2008. As no material work had been done at the site, a further visit was deemed not to be required in February 2010.

WAI is independent of IRC and all of its mining properties. Neither WAI, nor the Wardell Armstrong Group, nor any of its employees or associates involved in the preparation of this CPR holds any share or has any direct or indirect pecuniary or contingent interests of any kind in IRC or its mining properties. WAI is to receive a fee for its services (the work product of which includes this report) at its normal commercial rate and customary payment schedules. The payment of our professional fee is not contingent on the outcome of this report and IRC has not provided WAI with any indemnities.

The purpose of this CPR is to provide an independent technical assessment of IRC's iron ore assets to be included in the prospectus for IRC's initial public offering ("IPO") on the main board of The Stock Exchange of Hong Kong Limited ("HKSE"). This technical report has been prepared in accordance with the Rules Governing the Listing of Securities on The Stock Exchange of Hong Kong Limited (the "Listing Rules") as effective at the date of this report.

Where applicable, Mineral Resources and Ore Reserves have been described using the Australasian Code for Reporting Exploration Results, Mineral Resources and Ore Reserves (the "JORC Code (2004)") prepared by the Joint Ore Reserves Committee of the Australasian Institute of Mining and Metallurgy, Australian Institute of Geoscientists and Minerals Council of Australia in 1999 and revised in 2004.

The evidence upon which the estimated Mineral Resources and Ore Reserves are based includes the deposit geology, drilling and sampling information, project economics and past production data. The basis upon which WAI has formed its view on the Mineral Resource and Ore Reserve estimates include the site visits of WAI's professionals to IRC's mining properties, interviews with IRC's management, site personnel and consultants, analysis of the drilling and sampling database, procedures and parameters used for the estimates and comparison with past production.

The scope of work conducted by WAI included technical analysis of the project geology, Mineral Resource and Ore Reserve estimates and a review of mining, processing, production, environmental management, occupational health and safety, operating costs, and capital costs.

WAI has not undertaken an audit of IRC's data, or reviewed the tenement status with respect to any legal or statutory issues. WAI's CPR comprises an Introduction, followed by reviews of the technical aspects of Geology, Mineral Resources and Ore Reserves, Mining, Processing, Production, Operating and Capital Costs, Environmental Management, and Occupational Health and Safety issues, for each of the mining properties, as well as a Risk Analysis for the IRC iron ore projects on an overall basis. We trust that the CPR adequately and appropriately describes the technical aspects of the projects and addresses issues of significance and risk. Subject to the foregoing, Dr. Phil Newall is the Competent Person as that term is defined in Chapter 18 of the Listing Rules and in that capacity takes overall responsibility for this Competent Person's Report for the purpose of Listing Rule 18.21(3).

This CPR documents the findings of the WAI review of IRC's iron ore mining projects completed to the date of this letter. The sole purpose of this report is for the use of the Directors of IRC and advisors and its sponsor and advisors in connection with IRC's IPO prospectus and should not be used or relied upon for any other purpose. Neither the whole nor any part of this CPR nor any reference thereto may be included in or with or attached to any other document or used for any other purpose, without WAI's written consent to the form and context in which it appears. WAI consents to the inclusion of this report in IRC's IPO prospectus, in the form, context and content provided, for the purpose of the IPO on the HKSE.

Yours faithfully

for Wardell Armstrong International Ltd

Dr. Phil Newall
Director — Mining and Minerals
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CONSULTANTS AND INTERESTS

Wardell Armstrong International (WAI) is an internationally recognised, independent minerals industry consultancy. The consultants used in the preparation of this report are employed directly by WAI and have relevant professional experience, including prior field experience of the geology and mineralisation of iron ore deposits in Central Asia and Russia.

Details of the principal consultants involved in the preparation of this document are as follows:

Phil Newall, PhD, BSc, ARSM, MCSM, CEng, FIMMM, **Director,** is a mining geologist with over 25 years' experience of providing consultancy services to minerals companies throughout the world, with particular specialisation in the CIS, Europe, Central and West Africa, and China. He has developed an extensive portfolio of exploration and mining-related contracts, from project management through to technical audits of a large variety of metalliferous and industrial mineral deposits. Dr Newall is a Qualified Professional Member and Fellow of the Institute of Materials, Minerals and Mining in the UK, a Registered Chartered Engineer of the Engineering Council (UK) and meets all the requirements for a "Competent Person" as defined by both the 2004 Joint Ore Reserves Committee Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (the "JORC" Code) and National Instrument 43-101.

Owen Mihalop, BSc (Hons), MSc, MCSM, CEng, MIMMM, **Technical Director,** is a chartered mining engineer with 15 years' broad-based experience in the mining and quarrying industries. He has gained experience in grass-roots exploration through to large scale open-pit and underground mining projects across Ireland, Bulgaria, Spain and Canada. He has worked as an operations manager in industrial mineral mining and quarrying operations in the UK and has gained considerable project management and financial evaluation experience through these roles. Owen is a Qualified Professional Member of the Institute of Materials, Minerals and Mining in the UK, a Registered Chartered Engineer of the Engineering Council (UK) and meets all the requirements for a "Competent Person" as defined by both the 2004 Joint Ore Reserves Committee Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (the "JORC Code") and National Instrument 43-101.

Daniil Lunev, DipEng, PhD, **Mining Engineer,** is a Russian national whose specialist areas are mine scheduling, mine optimisation and mining equipment. His skills include optimisation of underground and open pit mining equipment, calculations of mining transport systems and estimation of efficiency and reliability of mining equipment. He is particularly experienced in belt conveyor system development, modernisation, construction and resolving conveyor application problems. Dr Lunev holds a Diploma and Doctorate in Mining Engineering from St. Petersburg University.

EurGeol. **Mark Owen,** MCSM, BSc, MSc, CGeol, FGS; **Technical Director,** has worked for over 25 years as a mine and exploration geologist in both the metalliferous and industrial mineral mining sectors. He has considerable expertise in front line production mining, both in underground and exploration environments, working on mines in the UK, Saudi Arabia and Venezuela. Throughout his experience he has been responsible for resource estimation, exploration planning and the management, environmental impact assessment and implementation of remediation programmes for a broad range of minerals. Mark is a Qualified Professional Member and Fellow of the Geological Society in the UK, a Registered Chartered

Geologist, a Registered European Geologist and meets all the requirements for a "Competent Person" as defined by both the 2004 Joint Ore Reserves Committee Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (the "JORC Code") and National Instrument 43-101.

EurIng. **Adam Wheeler,** BSc, MSc, CEng, MIMMM, **Manager of Resources,** is a chartered mining engineer specialising in the application, customisation and management of mining and geological software systems. He has particular expertise relating to general mining/geological software systems used in the geostatistical resource and reserve assessment for both open pit and underground optimisation. His skills include undertaking geostatistical studies, Ore Reserve estimation, geological modelling and mine planning, and training of personnel. Adam is a Qualified Professional Member of the Institute of Materials, Minerals and Mining in the UK, a Registered Chartered Engineer of the Engineering Council (UK), a Registered European Engineer and meets all the requirements for a "Competent Person" as defined by both the 2004 Joint Ore Reserves Committee Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (the "JORC Code") and National Instrument 43-101.

Philip King, BSc (Eng) Mineral Technology (Hons), MIMMM, **Technical Director,** has 28 years' minerals processing experience ranging from laboratory testwork and pilot plant operations through to plant commissioning, operations and trouble-shooting. He is experienced in the technical and financial evaluation of many mining projects through the completion of both pre-feasibility and feasibility studies. He has been involved in process design and engineering studies, equipment selection, and capital and operating cost estimates. Philip is a Qualified Professional Member of the Institute of Materials, Minerals and Mining in the UK.

John Eyre, FRICS, MIMMM, MRIN, MIQ, **Technical Director,** has over 30 years' experience in the international minerals industry as, variously, a mineral surveyor, minerals and environmental manager, lecturer, consultant and mineral agent in over 30 countries throughout the world. He has headed minerals market analysis, environmental auditing, environmental impact assessment and technical and economic studies over the last 15 years. John is a Qualified Professional Member of the Institute of Materials, Minerals and Mining in the UK and a Fellow of the Royal Institute of Chartered Surveyors.

Neither WAI, its directors, employees nor company associates hold any securities in IRC, nor any subsidiaries or affiliates, nor have:

- Any rights to subscribe for any IRC securities either now or in the future;
- any vested interest or any rights to subscribe to any interest in any properties or concessions, or in any adjacent properties and concessions held by IRC; nor
- been promised or led to believe that any such rights would be granted to WAI.

The only commercial interest WAI has in relation to IRC is the right to charge professional fees to IRC at normal commercial rates, plus normal overhead costs, for work carried out in connection with the investigations reported herein.

CLASSIFICATION OF GEOLOGICAL RESOURCES AND RESERVES IN ACCORDANCE WITH THE JORC CODE (2004)

Reporting Of Mineral Resources

Extracts from the JORC Code (2004), which define the type of Mineral Resources and Ore Reserves are presented below:

A 'Mineral Resource' is a concentration or occurrence of material of intrinsic economic interest in or on the Earth's crust in such form and quantity that there are reasonable prospects for eventual economic extraction. The location, quantity, grade, geological characteristics and continuity of a Mineral Resource are known, estimated or interpreted from specific geological evidence and knowledge. Mineral Resources are sub-divided, in order of increasing geological confidence, into *Inferred*, *Indicated* and *Measured* categories.

An '*Inferred* Mineral Resource' is that part of a Mineral Resource for which tonnage, grade and mineral content can be estimated with a low level of confidence. It is inferred from geological evidence and assumed but not verified geological and/or grade continuity. It is based on information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes which may be limited or of uncertain quality and reliability.

An '*Indicated* Mineral Resource' is that part of a Mineral Resource for which tonnage, densities, shape, physical characteristics, grade and mineral content can be estimated with a reasonable level of confidence. It is based on exploration, sampling and testing information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes. The locations are too widely or inappropriately spaced to confirm geological and/or grade continuity but are spaced closely enough for continuity to be assumed.

A '*Measured* Mineral Resource' is that part of a Mineral Resource for which tonnage, densities, shape, physical characteristics, grade and mineral content can be estimated with a high level of confidence. It is based on detailed and reliable exploration, sampling and testing information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes. The locations are spaced closely enough to confirm geological and/or grade continuity.

Reporting of Ore Reserves

An 'Ore Reserve' is the economically mineable part of a *Measured* or *Indicated* Mineral Resource. It includes diluting materials and allowances for losses which may occur when the material is mined. Appropriate assessments, which may include feasibility studies, have been carried out, and include consideration of and modification by realistically assumed mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors. These assessments demonstrate at the time of reporting that extraction could reasonably be economically justified. Ore Reserves are sub-divided in order of increasing confidence into *Probable* Ore Reserves and *Proven* Ore Reserves.

Probable Ore Reserves and Proven Ore Reserves

A '*Probable* Ore Reserve' is the economically mineable part of an *Indicated*, and in some circumstances *Measured* Mineral Resource. It includes diluting materials and allowances for losses which may occur when the material is mined. Appropriate assessments, which may include feasibility studies, have been carried out, and include consideration of and modification by realistically assumed mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors. These assessments demonstrate at the time of reporting that extraction could reasonably be justified.

A '*Proven* Ore Reserve' is the economically mineable part of a *Measured* Mineral Resource. It includes diluting materials and allowances for losses which may occur when the material is mined. Appropriate assessments, which may include feasibility studies, have been carried out, and include consideration of and modification by realistically assumed mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors. These assessments demonstrate at the time of reporting that extraction could reasonably be justified.

ADDITIONAL POINTS OF NOTE

Reporting of Dates

It should be noted that throughout this CPR, data have been presented as accurate to the date at which information was provided or work completed. However, WAI considers that all such data presented in this document and any assumptions which underpin it, remains valid as of the date of publication of this report unless specifically stated otherwise.

Use of Terminology

Mineral Resources described as JORC-Compliant and/or "in accordance with the guidelines of the JORC Code (2004)" have been modelled and classified under the guidelines of the JORC Code (2004) as it has been described in the sub-section "Reporting of Mineral Resources in accordance with the JORC Code (2004)" in this Appendix V — "Competent Person's Report."

The IRC Group has historically produced reserve and resource data for its operations in Russia in accordance with the Russian System in order to satisfy relevant Russian regulatory requirements and for its own internal geological purposes. This information is publicly available, having been disclosed to the market in accordance with UK requirements which applied to the IRC Group from time to time. It has not been included in the prospectus as Russian System data does not meet the current requirements of the Listing Rules.

The Sponsor does not consider that the omission of the Russian System reserve and resource data for the Group's mining assets will result in the omission of material information from the prospectus.

EXECUTIVE SUMMARY

WAI was commissioned by IRC, in May 2010, to prepare a CPR on the iron ore assets held by IRC in the far east of the Russian Federation ("Russia"), as part of the listing document for IRC's IPO on the main board of the Hong Kong Stock Exchange.

This CPR considers all aspects of the deposits, covering geology and resources, exploration potential, mining, processing, capital and operating costs and environmental and social issues.

Iron Ore Assets

As part of the CPR, WAI reviewed the status of the Kuranakh Project, Kimkan & Sutara, Garinskoye, Garinskoye Flanks, Kostenginskoye and Bolshoi Seym projects, referring to the Feasibility Studies and associated technical reviews of the deposits of each project. In addition, a Technical Due Diligence produced by WAI in March 2010 was reviewed and updated. The tables below summarise the principal salient details for each project and the current Mineral Resources. Detailed information on each deposit is provided in subsequent sections of this CPR.

Overview of Iron Ore Mining Properties

Project	Location	Project Status	Type of Mine	Report Section
Kuranakh	North west Amur Region, Russia.	Advanced stage of development, preliminary mining in 2008-09, full scale mining at a rate of 2.6Mtpa in H2 2010, with 2.6Mtpa production expected for a full year in 2011.	Open Pit	2
Kimkan & Sutara	North EAO Russia	Full Feasibility Study stage completed. Early stage development commenced. Iron ore resource identified, mine design and optimisation complete. Pre-stripping works have already commenced along with trial mining at Kimkan Central.	Open Pit	3
Garinskoye	Central Amur Region, Russia.	Garinskoye is currently an active advanced exploration project. No mining has taken place on the site. IRC has completed scoping studies and a feasibility studies detailing future plans.	Open Pit	4
Garinskoye Flanks	Central Amur Region, Russia.	Viewed as an extension to the main Garinskoye Deposit. Currently, no development has been carried out.	—	4
Kostenginskoye	24km south of Kimkan Deposit	Exploration and Technical Testing carried out/ continuing, with Preliminary Resource Estimation carried although resources not confirmed by GKZ. Considered as a continuation of operations at Kimkan & Sutara on a macro scale.	—	5
Bolshoi Seym	40km south east of the Kuranakh Deposit	Currently (June 2010) in the final six months of a 3 year exploration campaign. IRC owns 49% of Uralmining, the company that owns the licence to develop the Bolshoi Seym deposit. IRC has the right to appoint the General Director of Uralmining.	—	6

Summary of Principal Mineral Resources by Project*
In accordance with the guidelines of the JORC Code (2004)

Project	Deposit	C.O.G.**	Mineral Resources (Mt)	Resource Category	Fe_{Total} (%)
Kuranakh	Saikta	17%	21.7	*Indicated*	30.8
			0.01	*Inferred*	22.2
Kimkan & Sutara	Kimkan Central	25%	99.7	*Indicated*	34.3
			15.0	*Inferred*	33.3
	Kimkan West	25%	51.1	*Indicated*	33.5
			43.0	*Inferred*	33.6
	Maisky	25%	15.1	*Indicated*	32.0
			20.7	*Inferred*	31.9
	Sovkhozniy	25%	4.4	*Inferred*	30.2
	Sutara	18%	195.7	*Measured*	32.4
			231.0	*Indicated*	32.2
			65.5	*Inferred*	31.0
Garinskoye	Garinskoye	20%	219.9	*Indicated*	32.0
			156.0	*Inferred*	29.3
Total Measured and Indicated (JORC-Compliant)			***834.2***	***Measured+Indicated***	***32.5***
Total Inferred (JORC-Compliant)			***304.6***	***Inferred******	***30.6***

* Mineral Resources are presented as of the date of this CPR. Please refer to the relevant footnotes to the tables on pages 18, 20, 21 and 23 of this CPR for further information regarding this reference date.

** C.O.G. or cut-off grade means the lowest grade of mineralised material considered economic, used in the calculation of Mineral Resources and Ore Reserves. Mineral Resources are reported to a specific cut-off grade which takes into account both the economic viability of future mining operations and the geological continuity of the mineralisation which may or may not reflect natural geological and structural boundaries. Ore Reserves are estimated on the basis of an economic cut-off grade which is calculated based on current metal prices and the estimated costs of exploitation of the mineralised material.

*** For a description of the categories of *Measured*, *Indicated* and *Inferred* JORC-Compliant Mineral Resources, and the level of confidence attributable to each category, please refer to the section headed "Classification of Geological Resources and Reserves—Reporting of Mineral Resources in accordance with the JORC Code (2004)" in this report.

Summary of IRC Prospective Projects

Project	Deposit	Resource (Mt)
Garinskoye Flanks	Garinskoye	No JORC Resource Statement Available
Bolshoi Seym	Bolshoi Seym	No JORC Resource Statement Available
Kostenginskoye	Kostenginskoye	No JORC Resource Statement Available
Kuranakh	Kuranakh	No JORC Resource Statement Available

Summary of Ore Reserves in accordance with the guidelines of the JORC Code (2004)

Project	Deposit	Probable Ore Reserves* Mt	Fe %	TiO_2 %	Fe Mt	TiO_2 Mt
Garinskoye	Garinskoye	211.7	36.0	n/a	76.2	n/a
	Total	**211.7**	**36.0**		**76.2**	

Note: JORC-Compliant reserves are not available for Kuranakh or Kimkan & Sutara. Ore Reserves are presented as at the date of this CPR. It is WAI's opinion that the above Ore Reserves are feasible Ore Reserves under the JORC Code (2004).

* For a description of the categories of Proven and Probable Jorc-Compliant Ore Reserves, and the level of confidence attributable to each category, please refer to the sub-section headed "Cautionary Note to Investors Concerning Measured, Indicated and Inferred Resources" of the section headed "Classification of Geological Resources and Reserves" in this prospectus.

Kuranakh Project

The Kuranakh Project, consisting of the Kuranakh and Saikta deposits (the "Kuranakh Deposit" and the "Saikta Deposit", respectively), is located in the Tynda district of the Amur Region, in the east of the Russian Federation. The deposits are located at latitude 56°41' north and longitude 120°58' east, at a distance of 45km south-east from the nearest village of Olekma, which lies on the route of the Baikal Amur Magistral (BAM) railway line.

The Saikta Deposit is a medium-sized titanomagnetite deposit which is currently in production, having commenced preliminary mining in 2008 and open pit mining in May 2010. From the site visit carried out in February 2010, it is clear that IRC has demonstrated the ability to bring a greenfield asset into operation. The results of the operations will be the ultimate test, but the project appears to benefit from its resource base and good access to infrastructure.

The Mineral Resources for the Saikta Deposit were estimated in 2008 by WAI using a Datamine® block model and were calculated to cut-off grades of 5% Fe_{total} and 17% Fe_{total}. This resource estimation was carried out in accordance with the guidelines of the JORC Code (2004). The results for cut-off grade of 17% Fe_{total} are summarised in the table below.

Saikta Deposit Mineral Resources*
In accordance with the JORC Code (2004) — 17% Fe C.O.G.

Resource Classification	Mineral Resources (Mt)	Fe_{Total} (%)	Fe_{Magn} (%)	TiO_2 (%)	Fe_{Total} (Mt)	Fe_{Magn} (Mt)	TiO_2 (Mt)
Indicated	21.663	30.82	20.26	9.58	6.677	4.389	2.075
*Inferred***	0.011	22.22	12.40	11.22	0.002	0.001	0.001

* Mineral Resources are presented as of 01 September 2008. As only 0.15Mt of ore was extracted during 2008-2009, and stockpiled without further processing, the above statement remains valid as of the date of this CPR.

** For a description of the categories of *Measured*, *Indicated* and *Inferred* JORC-Compliant Mineral Resources, and the level of confidence attributable to each category, please refer to the section headed "Classification of Geological Resources and Reserves — Reporting of Mineral Resources in accordance with the JORC Code (2004)" in this report.

A resource estimate for the Kuranakh Deposit has been carried out in accordance with the Russian System only, with reserves in the *B*, C_1 and C_2 categories and this was audited by SRK in March 2007. Details of these Russian System calculations have previously been published by the IRC Group.

In 2010, re-optimisation of the Kuranakh Project Russian System reserves statement, originally created in 2008, using updated commodity prices was carried out. WAI had previously reviewed the Kuranakh Project Russian System reserves statement as part of a Mineral Expert's Report in 2008. Details of these Russian System calculations have previously been published by the IRC Group.

Operations at the Kuranakh Project commenced in late 2008, with the mining of the Saikta Deposit open pit. Preliminary trial mining took place in October-December 2008 with subsequent trial processing. A total of 0.1Mt of ore was mined in 2008, and 0.052Mt in 2009. Mining during 2009 focused on stripping works to remove overburden, rather than ore mining, as the processing plant was not in operation due to instability in the iron ore market.

During 2009, development works were carried out on the Saikta Deposit open pit, with operations concentrating on bench development at the 730-700m elevations with some preparation of the 690-670m elevations. The total amount of overburden moved in 2009 was 1.4Mm^3 and the total amount of ore mined was 0.052Mt. This ore was stockpiled at the crushing and screening plant pending the commissioning of the Olekma processing plant during the first half of 2010. As at 31 December 2009, approximately 0.12Mt of ore had been stockpiled.

The Olekma processing plant at the Kuranakh Project was commissioned in May 2010, with production commencing in June 2010. Operations are expected to achieve the target run-rate production of 2.6Mtpa during 2010. In addition to the 2.6Mtpa of ore, an average of 8.5Mtpa of waste will be mined each year.

The operating cost for mining operations has been forecast by IRC as US$9.40 per tonne of ROM ore, which WAI considers to be realistic and in line with operating costs for comparable projects.

The crushing and screening plant commenced production of pre-concentrate in 2008, but due to the downturn in the market for iron ore pre-concentrate, the plant did not operate in 2009 although some additional infrastructure construction took place at the plant during that year including construction of administration buildings, maintenance workshops and a water treatment facility. The crushing and screening plant was re-commissioned in May 2010 and production re-commenced in June 2010.

Progress on the construction of the Olekma processing plant was slow during the first half of 2009, although by the end of December 2009 approximately 90% of the iron concentrate circuit and approximately 65% of the ilmenite circuit were complete. The Olekma processing plant commenced producing concentrate in the first half of 2010 and is expected to reach full capacity in the second half of 2010.

From an environmental and social standpoint, IRC has undertaken diligent baseline studies in order to establish the existing environmental and socioeconomic status within and outside the project area. The background data have been incorporated into the Environmental Impact Assessment ("EIA") which has successfully passed. It is WAI's opinion that IRC's actions towards satisfying both the Russian national standards and requirements, and achieving international best practice are successful on both the project and the corporate level.

Kimkan and Sutara Project

Kimkanskoye and Sutarskoye ("Kimkan" and "Sutara" respectively, together "K&S") are large magnetite iron ore deposits. K&S are located in the Obluchenski District of the EAO Region approximately 40km from the Russian border with the PRC. The Kimkan deposit is located approximately 15km north-northeast of the Sutara deposit. A feasibility study, conducted by PHME, completed in 2008 (the "KSG Feasibility Study (2008)") and revised in 2009 (the "K&S Feasibility Study (2009)") by PHME (together, the "Feasibility Studies"), highlighted that the project benefits from excellent access to transport infrastructure in Russia, with significant potential cost advantages in comparison to global peers.

Giproruda, a Russian consulting company which is majority owned by IRC, was employed to conduct the geotechnical analysis and pit design and optimisation work for the KSG Feasibility Study (2008). Having reviewed all of the available data relating to the Kimkan and Sutara deposits in the KSG Feasibility Study (2008), WAI considers all aspects of the KSG

Feasibility Study (2008) in relation to K&S to be technically and financially sound and valid as at the date of this CPR.

The Kimkan and Sutara deposits are at an early stage of development with trial mining having commenced in Q1, 2010. A large Mineral Resource of iron ore has been identified with mine design and optimisation completed. Conventional open pit mining is planned ultimately from three open pits: Kimkan West, Kimkan Central and Sutara.

The full development of the K&S Project is dependent on obtaining appropriate funding, a process which is ongoing.

During 2009, a contract was signed with Dalgeologia to carry out the geological section of the Project Technical Study Conditions report for K&S which will be submitted to the regional authorities for approval during 2010. This report, created in accordance with the Russian System, proposes to combine the geological studies for Kimkan and Sutara which will entail additional drilling at the former taking approximately one year. In line with this, the K&S mineral licence requirements were changed in September 2009 with revised licence terms, including the postponement of K&S's required milestones for the next three years. The preparation of the technical documentation and the start of construction was required (by the terms of the licence) before 30 December 2013, and to date, mining at Kimkan has been carried out within these terms. Full-scale mining is not planned to begin at Sutara in line with the conditions of the licence (the mining schedule shows production at Sutara beginning in 2023) and it must be ensured that the licence may be amended to reflect this. IRC is aware of this potential issue.

WAI undertook a review of the Kimkan Mineral Resource estimate, carried out by RJC in July 2008, and considers the information presented within the document to be valid as at the date of this CPR. A summary of the K&S Project Mineral Resources classified in accordance with the guidelines of the JORC Code (2004) is shown below using a 25% Fe_{total} C.O.G..

Kimkan Mineral Resources*
In accordance with the guidelines of the JORC Code (2004) — 25% Fe_{Total} C.O.G.

Orebody	Resource Classification	Mineral Resources	Fe_{Total}	Fe_{Total}
		(Mt)	*(%)*	*(Mt)*
Central Zone	*Indicated*	99.665	34.31	34.195
	Inferred	14.977	33.25	4.980
Western Zone	*Indicated*	51.060	33.49	17.100
	Inferred	43.044	33.63	14.476
Maisky Zone	*Indicated*	15.101	32.01	4.834
	Inferred	20.692	31.86	6.592
Sovkhoznyi Zone	*Inferred*	4.408	30.17	1.330
Total	***Indicated***	**165.826**	**33.85**	**56.129**
	Inferred*	**83.121**	**32.94**	**27.378**

* Mineral Resources are presented as of 01 September 2008. As no ore extraction took place and no resource/reserve update has been performed since that date, the above statement remains valid as at the date of this CPR.

** For a description of the categories of *Measured*, *Indicated* and *Inferred* JORC-Compliant Mineral Resources, and the level of confidence attributable to each category, please refer to the section headed "Classification of Geological Resources and Reserves — Reporting of Mineral Resources in accordance with the JORC Code (2004)" in this report.

The Sutara Mineral Resources were estimated by WAI in 2009 in accordance with the guidelines of the JORC Code (2004).

Sutara Mineral Resources*
In accordance with the guidelines of the JORC Code (2004) — 18% Fe_{Total} C.O.G.

Zone Resource Classification	Mineral Resources	Fe_{Total}	Fe_{Magn}	Fe_{Total}
	(Mt)	*(%)*	*(%)*	*(Mt)*
Measured	195.66	32.43	20.84	63.46
Indicated	230.95	32.24	20.50	74.40
*Inferred***	65.53	30.97	19.24	20.39
Total	492.14	32.00	20.52	158.27

* Mineral Resources are presented as of 01 November 2009. As no ore extraction took place and no resource/reserve update has been performed since that date, the above statement remains valid as at the date of this CPR.

** For a description of the categories of *Measured*, *Indicated* and *Inferred* JORC-Compliant Mineral Resources, and the level of confidence attributable to each category, please refer to the section headed "Classification of Geological Resources and Reserves — Reporting of Mineral Resources in accordance with the JORC Code (2004)" in this report.

WAI re-ran the open pit optimisation models for Kimkan in May 2010 using the same technical and economic parameters used by PHME in the KSG Feasibility Study (2008), which in WAI's view remain valid as at the date of this CPR, utilising the pit shells designed by PHME and the WAI and RJC resource block models, which are compliant with the guidelines of the JORC Code (2004).

The reserves under the Russian System for Kimkan Central, Kimkan West Phase 1 Open Pit and Sutara, were estimated by PHME for the KSG Feasibility Study (2008) and updated in 2009 by RJC (WAI having revisited this estimation in May 2010 as outlined above). The 2009 open pit reserves, produced by PHME in accordance with the Russian System, form the basis of IRC's operating schedule as only Russian System reserves (e.g. A, B and C categories) can be planned for extraction under Russian regulations. Details of the Russian System data have previously been published by the IRC Group.

WAI did not perform an optimisation and a reserve estimate for Sutara as the exploitation of this deposit is scheduled to start during 2023 (year 11) of project development, by which time the economic parameters forming the basis of such estimates are highly likely to have changed.

The operating schedules (based on the reserve statement prepared in accordance with the Russian System) proposed for Kimkan and Sutara are closely linked. Initial production will begin at Kimkan in 2012, ramping-up during years 1-3 to a combined total production of 10Mtpa (8Mtpa from Central Kimkan, 2Mtpa from West Kimkan). During project year 14, production at Kimkan is estimated to decrease whilst production at Sutara commences. By project year 15, it is estimated a total production of 10Mtpa will be extracted from Sutara alone.

At the time of the WAI site visit in February 2010, the clearing of land was underway at Kimkan, around the proposed accommodation camp site, process plant site, explosives site, ash dump, pulp-line, access roads and waste disposal sites. In addition, all required geotechnical exploration for the new rail connection between Izvestkovoye station and the process plant site, a distance of 4.3km, was completed in March 2009.

The first section of a permanent accommodation camp was constructed in March 2009, consisting of two accommodation blocks (each able to house 200 people) and an administration block, with the construction of the camp expected to be fully completed by the end of 2010, accommodating around 1,500 people.

From an environmental and social standpoint, WAI considers that the K&S operations are being conducted in accordance with Russian State requirements and laws pertaining to environmental protection, health and safety guidelines and obligations concerning the socio-economic development. In addition, IRC has committed to achieving international best practices at K&S and is in the process of successfully implementing such practices in accordance with IFC requirements (as appropriate).

Furthermore, the baseline study reports reviewed by WAI indicate no areas of high environmental risks, however, potential impacts are continuously assessed by means of a detailed ESIA and environmental monitoring.

WAI also considers that a Community Development Plan and Information Disclosure Plan should be formalised to support IRC's environmental quality objectives and considers that the components required to execute this task are in place.

Garinskoye

The Garinskoye iron ore deposit is one of the few large iron ore deposits in the Russian Far East which was explored and studied extensively during the Soviet era. It has a favourable geographic position in relation to probable iron ore consumers in northern China.

The deposit was first discovered in 1949 as a consequence of the verification of an aeromagnetic anomaly. In 1950-58, detailed exploration was carried out including pits, trenches, shafts and underground development, together with drill holes.

Garinskoye is currently an active advanced exploration project. No mining has taken place on the site. IRC completed scoping studies and a feasibility study (the KSG Feasibility Study (2008)) detailing future plans in 2009.

Giproruda, a Russian mining engineering services institute which is majority owned by IRC, was employed to conduct the geotechnical analysis and pit design and optimisation work for the KSG Feasibility Study (2008). Having reviewed all of the available data relating to the Garinskoye mine in the KSG Feasibility Study (2008), WAI considers all aspects of the KSG Feasibility Study (2008) in relation to Garinskoye to be technically and financially sound and valid as at the date of this CPR.

In 2007, IRC completed a confirmation drilling programme at Garinskoye which included the following:

- Core drilling — 8,411.9m;
- Trench samples — 3574.2m^3;
- Metallurgical tests — four tests each of 1,000kg of low phosphorus, phosphorus, medium grade (Fe_{total} 42%), low grade off-balance (Fe_{total} 18.6%) ores; and
- Sample testing — 13,000kg of core and trench samples were sent to the IRC Laboratory in Blagoveshchensk.

WAI has reviewed all of the data from IRC including confirmation of the drilling programme conducted in 2007, in conjunction with the RJC resource model, created in 2008 using IPD[2], and concluded that the Mineral Resources are classified in accordance with the guidelines of the JORC Code (2004) as detailed in the table below.

Garinskoye Mineral Resources*
In Accordance with the guidelines of the JORC Code (2004) — 20% Fe_{total} C.O.G.

Resource Classification	Mineral Resource (Mt)	Fe_{Total} (%)	Fe_{Total} (Mt)
Indicated	219.9	32.03	70.4
*Inferred***	156.0	29.29	45.7

* Mineral Resources are presented as of 01 November 2008. As no ore extraction took place and no resource/reserve update has been performed since that date, the above statement remains valid as at the date of this CPR.

** For a description of the categories of *Measured*, *Indicated* and *Inferred* JORC-Compliant Mineral Resources, and the level of confidence attributable to each category, please refer to the section headed "Classification of Geological Resources and Reserves—Reporting of Mineral Resources in accordance with the JORC Code (2004)" in this report.

WAI considers that the Mineral Resources at Garinskoye are classified in accordance with the guidelines of the JORC Code (2004) and that RJC applied appropriate technical and economic parameters to the Mineral Resource when estimating the open pit reserves. In order to confirm that this reserve statement can be classified as a Mineral Reserve in accordance with the guidelines of the JORC Code (2004), WAI has run a reserve optimisation using the RJC parameters and the 2008 JORC Code (2004) compliant Mineral Resource model. The optimisation proves that Mineral Resources, contained within the designed open pit are economic and in the opinion of WAI are equivalent to *Probable* Ore Reserves under the guidelines of the JORC Code (2004). A summary of the Garinskoye Ore Reserves results is given in table below.

Garinskoye Ore Reserves*
In Accordance with the guidelines of the JORC Code (2004)

Ore Reserve (Mt)	Fe_{Total} (%)	Fe_{Total} (Mt)	Waste (Mt)
211.7	36.00	76.2	911.6

* Ore Reserves are presented as at the date of this CPR. It is WAI's opinion that the above Ore Reserves are *Probable* Ore Reserves under the JORC Code (2004)

WAI considers that the underlying assumptions of the KSG Feasibility Study (2008), upon which the open pit was designed, remain valid and that the reserve figures remain up to date.

In terms of mining, the nature of the deposit and the topography of the site are ideally suited for conventional open pit truck and shovel mining methods. The mine is due to commence operations with a production rate of 2Mtpa in 2014, ramping up to 10Mtpa of ore in 2016. In 2018, the mine is expected to be in full production and the planned total volume of rock mass mined is expected to be 28.8Mm^3, which will include 26.1Mm^3 of overburden and 10Mt of ore.

The major mine operating costs for Garinskoye averaged over the life of the project are estimated by IRC to be US$5.80 per tonne of ore.

Ore from Garinskoye will be pre-processed at the mine site and then transported by rail to the K&S processing facilities for further processing to produce a saleable concentrate. The development of the mine is dependent on the installation of a new railway line by the Federal Government; however the federal study into the rail connection has not yet begun.

Kostenginskoye

The Kostenginskoye deposit is located to the south of the K&S project, and it is understood by WAI that the deposit represents a natural continuation of the K&S deposits since, on a macro basis, it can be considered as an extension of the same geological zone.

The Kostenginskoye iron ore deposit was discovered in 1952-53 during geophysics research of the Malo-Khinganskiy iron ore field. During the period 1967-75, preliminary exploration works took place and a preliminary resource estimation was performed. There have been no changes made to the resource statement since that time.

In May 2007, "LLC Optima", a 100% subsidiary of IRC, was granted a licence for the Kostenginskoye iron ore deposit (licence "BIR 00421 TE" dated 28 May 2007, reviewed in January 2009 by the Russian State). The licence allows exploration works with subsequent mining operations. The terms of the licence do not restrict the depth at which the exploration works can be carried out.

Bolshoi Seym

In February 2006, IRC entered into an agreement with LLC Management Company "Intergeo" ("Intergeo") to form a new holding company for Uralmining, which owns the licence to develop the Bolshoi Seym deposit. Uralmining would be 49% owned by IRC and 51% owned by Intergeo.

The Bolshoi Seym deposit is located in the Tyndinskiy region, 27km from the Mostovaya station (on the Baikal Amur railway) and c.40km to the south east of Olekma, where IRC are constructing their Kuranakh project process plant. The Bolshoi Seym deposit therefore represents a natural extension to IRC's activities in this area.

The mineral licence covers an area of 26km^2 and extends to a depth of 1,000m. The licence was granted to Uralmining by the state authority in November 2005 and has a term of 25 years which may be extended with the consent of the licensing authority. It is a licence requirement to start production by 01 December 2012 with a minimum extraction rate of 2Mtpa, however this date may be extended with the consent of the licensing authority, and IRC is aware that this must be carried out as production will not have begun by this date.

WAI considers that this project is in the early stage of exploration. It is a large titanomagnetite iron ore deposit, which has considerable merit and therefore potential, and as such justifies the proposed exploration works, both to confirm the potential resources of the deposit and improve confidence levels in those resources that are present.

Details of the new machines and equipment, new plant and supporting facilities to be constructed, including the site area, expected completion time of construction, total expected construction costs and the method for financing the remaining development costs for each of the Kuranakh Project, the K&S project and the Garinskoye project are set out in their respective sections in this CPR.

Summary of Estimated Operating Costs

The estimated operating cost forecasts for the Kuranakh Project, K&S and Garinskoye are summarised in the table below.

Estimate of Project Operating Costs

Operating Cost Centre	Kuranakh Project (Estimated) US$/t Ore	K&S (Estimated) US$/t Ore	Garinskoye (Estimated) US$/t Ore
Workforce employment and Transportation of workforce	9.36 (Mining)	5.27 (Mining)	2.03
Consumables (including fuel oil)	10.50 (Processing)*	4.08 (Processing)*	8.13
Power, water and other services			0.79
On and off-site administration	1.98	0.52	0.61
Environmental protection and monitoring	0.17		
Product marketing and transport	15.82***	2.66	11.50
Non-income taxes and royalties, and contingencies*****	1.53	0.99	0.74
Total Operating Costs	**39.36**	**13.51**	**23.89**

* The IRC Cost Model (May 2010) presents costs for Mining and Processing but no further breakdown between personnel, consumables and service costs.

** The concentrate produced at the Kuranakh Project is predominantly titanomagnetite which involves greater beneficiation costs (especially power) than magnetite concentrate.

*** The cost is given inclusive of TiO_2 concentrate transportation, and thus appears higher than that for Kimkan & Sutara

**** Transportation of workforce is not material due to proximity of infrastructure.

***** The IRC Cost Model (May 2010) presents costs for these items but no further breakdown between them.

Summary of Estimated Capital Costs

The estimated capital cost forecasts of the Kuranakh Project, K&S and Garinskoye projects are summarised in the table below. CAPEX estimates are based on the Feasibility Studies. The Feasibility Studies used a combination of contractor and supplier quotations combined with cost estimates derived from first principles. WAI reviewed the Feasibility Studies and considers the assumptions to remain valid at the time of this CPR.

Combined Summary of Proposed Mining and CAPEX Schedules

	Unit	Total	2010	2011	2012	2013	2014	2015	2016-2020	2021	2022	2023	2024	2025-2036	2037-2049	2050
CAPEX by Project																
Kuranakh	US$M	**16**	10	6												
Kimkan	US$M	**400**	77	146	146	30										
Sutara	US$M	**161**								100	61					
Garinskoye	US$M	**353**	10	10	67	134	117	17								
Total CAPEX	**US$M**	**928**	**36**	**162**	**213**	**164**	**117**	**17**	**—**	**100**	**61**					
Mining																
Kuranakh	Mt	**36.5**	0.9	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	1.8			
Kimkan	Mt	**106.8**	—	—	2.0	8.0	10.0	10.0	10.0	10.0	10.0	6.8				
Sutara	Mt	**270.7**										2.9	10.0	10.0	10.0	7.8
Garinskoye	Mt	**220.0**					2.0	8.0	10.0	10.0	10.0	10.0	10.0	10.0		
Total Ore Mined	**Mt**	**634.0**	**0.9**	**2.6**	**4.6**	**10.6**	**14.6**	**20.6**	**22.6**	**22.6**	**22.6**	**22.3**	**21.8**	**20.0**	**10.0**	**7.8**

Note: CAPEX for 2010 is the outstanding amount as of 30 June 2010

Summary of Project Risks

WAI has conducted a risk assessment of the projects, rating identified risk factors as High, Medium and Low risk. The table below summarises the "high" risk factors identified. Mitigation measures for high risk factors are discussed in Section 7 of this report.

Summary of IRC Iron Ore Project Top-Rated Risks

Risk Factor Identified	Deposit (s)	Likelihood Rating	Consequence Rating	Overall Risk Rating
Poor weather preventing mining activity	All	Likely	Moderate	**High**
Mineralogy more complex/variable than predicted	All	Possible	Major	**High**
Lower product recovery than anticipated	All	Possible	Major	**High**
Power and fuel price increases in future	All	Likely	Moderate	**High**
Lower metal prices than forecast	All	Possible	Major	**High**
Failure to secure finance	K&S, Garinskoye	Possible	Major	**High**

WAI considers IRC has, where possible, mitigated these high risk factors and each of the projects are robust in nature.

1 INTRODUCTION

1.1 Terms of Reference

WAI was commissioned by IRC to prepare a CPR on the iron ore assets of IRC in the Russian Far East, as part of a prospectus for listing on the HKSE.

This CPR considers all aspects of the deposits, covering geology and resources, exploration potential, mining, processing, capital and operating costs and environmental and social issues, in accordance with the "Competent Person's" requirements of the HKSE as implemented on 13 June 2010.

1.2 Site Visits

Whilst no site visit has been carried out specifically for this CPR, WAI personnel visited the Kuranakh Project and the Kimkanskoye and Sutarskoye sites during February 2010 as part of a Technical Audit and Resource/Reserve Estimation of the assets on behalf of Petropavlovsk plc and similarly visited the Garinskoye site in November 2008. As such, WAI considered that further site visits were not required under the JORC Code (2004), as this work follows on from previous studies undertaken by WAI on the same iron ore assets (originally held by Aricom plc prior to its merger with Peter Hambro Mining (now Petropavlovsk plc)) in 2009. Additionally, it was considered that no site visit was required for Kostenginskoye or Bolshoi Seym given the early stage of these projects, whilst a further visit to Garinskoye was not necessary given that no material change had occurred at the site.

1.3 Study Strategy

The CPR methodology has been to review, examine and report on the existing information available on the various properties held by IRC in the Russian Far East, which includes geology, resources/reserves, mining and metallurgical data and basic economic parameters, in order to produce this CPR in accordance with the detailed scope of works provided by IRC.

In addition, WAI has prepared or audited resource estimates using Datamine® Studio 4, for the principal assets held by IRC, all in accordance with the guidelines of the JORC Code (2004).

The team responsible for the preparation of the CPR last visited certain of these IRC iron ore assets in November 2008 and February 2010 (see section 1.2 above). During these site visits, further information was gathered on infrastructure, equipment, costs, mining methods and environmental issues. For the project sites, the data originates from both the Soviet period and on-going mining/exploration activities.

1.4 Disclaimer

WAI has reviewed data provided by IRC on its assets in Russia, and has drawn its own conclusions therefrom, augmented by its direct field examination. WAI has not carried out any independent exploration work, drilled any holes nor carried out any sampling and assaying.

Significant amounts of data exists regarding the properties, much of which is related to more recent studies, but there is also some historic data. As is commonplace, WAI is unable to verify much of the historic data and utilises this data in good faith. In contrast, much of the more recent work undertaken by IRC has a specific audit trail in which WAI can place considerable confidence.

2 KURANAKH

2.1 Property Description & Location

2.1.1 Overview

The Kuranakh Project consists of the Saikta Deposit and Kuranakh Deposit. The Saikta Deposit is a medium sized titanomagnetite deposit which is in production with preliminary mining having commenced in 2008 and mining of iron ore re-commencing in May 2010 and production of concentrate commencing in June 2010. From the February 2010 site visit, it is clear that IRC has demonstrated the ability to bring a greenfield asset into operation. The results of operations will be the ultimate test, but the project appears to benefit from its resource base and good access to infrastructure.

The Kuranakh Project licence area contains two major areas of mineralisation, namely (from west to east):

- Kuranakh Deposit (historically known as Ore Zone 3; which is now known as the South, Intermediate and North Zones); and
- Saikta Deposit (containing Ore Zones 1, 2, 4 and 8 of which Ore Zone 1 is the largest).

2.1.2 Location

The Kuranakh Project is located in the Tynda district of the Amur Region, in the east of the Russian Federation. The Kuranakh Deposit and Saikta Deposit are located at a distance of 45km south-east from the nearest village of Olekma — population 517 (as of 31 December 2009), which lies on the route of the Baikal Amur Magistral (BAM) railway line (35km from the deposits at the closest point). The precise location of the deposits are shown in Figure 2.1 and Figure 2.2.

Figure 2.1: Amur Region showing deposit locations and (inset) location of Amur Region within Russian Federation

Figure 2.2: Location of the Kuranakh Project in the north west of the Amur Region (Approximate Route of BAM Railway shown in black)

2.1.3 Mineral Rights and Permitting

Olekminsky Rudnik, a 100% owned subsidiary of IRC, owns the exploitation licence to a 85km^2 area south of Olekma. The licence area is rectangular in shape and is approximately 4km by 21km in size, with the long-axis of the area being orientated east-north-east — west-south-west.

The four co-ordinates of the licence are given below and shown in Figure 2.3:

Table 2.1: Olekminsky Rudnik Co-ordinates (Kuranakh Project)

Point	Latitude (N)	Longitude (E)
1	56°41'35"	120°26'30"
2	56°44'00"	120°26'00"
3	56°45'30"	120°45'00"
4	56°43'15"	120°45'30"

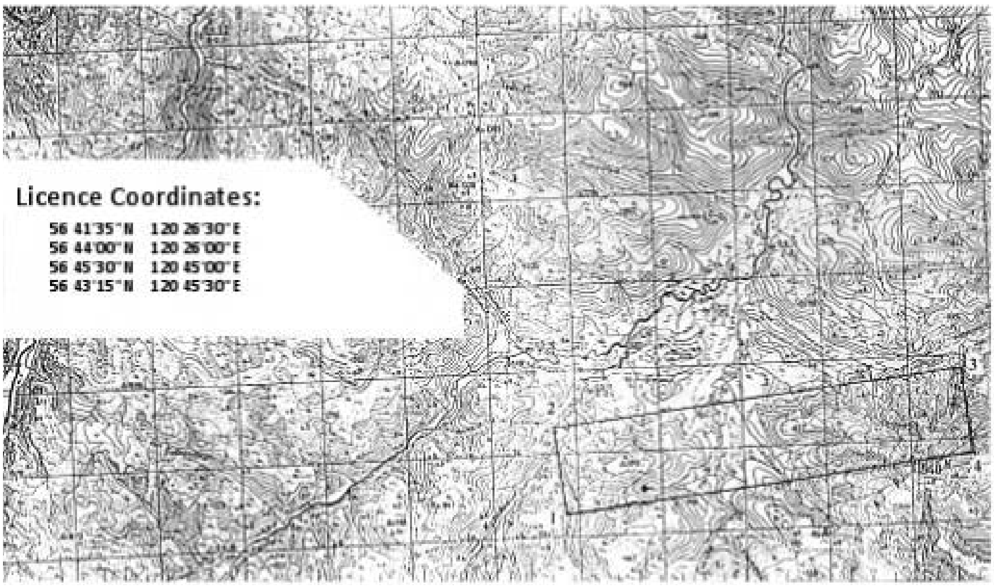

Figure 2.3: Area of Kuranakh Project Exploitation Licence (Grid lines at 5km spacing)

> ***WAI Comment:*** *WAI has inspected the licence for Kuranakh and has no reason to believe that the boundaries are not correct and in good order.*

Land is required, under the licence, to be transferred from the State Forest Fund if it is to be used for industrial purposes (including mining operations). The total area to be transferred from the State Forest Fund for the Kuranakh Project is approximately 6,950,000m^2, whilst the total area of disturbed lands from mining is approximately 4,000,000m^2.

2.2 Accessibility, Climate, Local Resources, Infrastructure and Physiography

2.2.1 Accessibility and Infrastructure

The nearby settlement of Olekma lies approximately 430km north-west by BAM rail link from the main city of Tynda. By rail, Tynda is located approximately 890km north of Blagoveschensk, the regional centre of the Amur Region, which lies on the border with China. The BAM railway line connects to the Trans-Siberian railway line and the rest of Russia and China.

Access to the site is currently possible via the BAM Railway to Olekma, with an unsealed road providing access for vehicles during winter months and additional personnel access via helicopter. International air travel to the region is available at Blagoveshchensk.

Prior to construction works taking place at the site, little basic infrastructure was present, however the relevant infrastructure has now been installed as described in section 2.7.

2.2.2 Climate, Physiography and Demographics

The Kuranakh Project is situated within the north-east foothills of the Kalarskii Range which is characterised by a low mountain taiga landscape with elevations of up to 1,600m. The deposit area generally lies no more than 600-750m above the base of the valleys. Peaks and steep slopes are scree covered. Typically the steepness of the slopes ranges between 20-35°.

In the deposit region, permafrost exists to a minimum of 300m throughout the licence area, according to IRC drilling results. In summer, surface thaw is insignificant and varies between 0.2 to 1.5m, more rarely to 3.0-3.5m, depending on exposure and the extent of tree cover on the slopes. A weathered layer extends to a depth of 3-50m with a surface covering of friable alluvial-diluvial sediment which does not extend down beyond 1-6m (average 2.5m).

The Kuranakh River, flowing adjacent to the deposit, freezes during the winter period. Sufficient process and potable water are extracted directly from underground aquifers by boreholes.

No major problems relating to the hydrogeological conditions affecting the deposit have been identified. The main water inflow to the open pit will be from atmospheric precipitation. With a small flow rate and unconfined run-off, water above the permafrost is not considered a serious problem affecting mine operations. Sub permafrost water flow is considered localised in fractured rocks, amounting to approximately 0.5l/s.

The vegetation in the area is typical of the northern part of the taiga zone. Taiga forest (Dahurian larch, fir, poplar, birch and aspen) predominates up to an elevation of approximately 1,000m. At heights of 1000-1200m, cedar elfin wood, alder and dwarf arctic birch predominate. High-quality commercial forests with a predominant trunk diameter of 25-30cm are present in the Kuranakh River valley.

The climate is extremely continental, characterised by a long severe winter and a short, moderately hot summer. The winter season lasts for 7 months. The average precipitation is 456mm, 70% of which occurs in the summer season. Snow thaw begins in April and ends in June. Snow cover forms at the end of September and reaches a thickness of 0.8 to 1.5m. Temperatures fall to -54°C at their lowest in January and +39°C at their highest in June. Average annual temperature is -4.6°C. The mean monthly temperature in January is -32.8°C.

According to the 2002 Census, the total population of the Amur Region is approximately 900,000 of which some 219,000 reside in the regional capital of Blagoveshchensk.

2.3 Geological Setting, Deposit Types and Mineralisation

Regionally, the Kuranakh and Saikta Deposits are located at the intersection of structures within the Aldan shield and the Stanovoy fold-block system. The main structural element of the area is the Kalarskii gabbro-anarthosite block which covers approximately 1,500km^2. Eight separate iron-titanium ore fields (deposits) have been identified within this area.

The largest deposits include those of the Kuranakh Project and Bolshoi Seym project (discussed further in section 6), which are located in the northern part of the Kalarskii block in the region of the Imangrakansky fault, which is considered a branch of the Stanovoi deep fault.

The structure of the Kalarskii Massive involves a wide range of rocks, from modern and ultra-basic to acid and sub-alkaline. Associated with them spatially, and, presumably, genetically are iron-titanium (with phosphorus) and rare-earth mineralisation. The iron-titanium mineralisation in the Kuranakh Massive is polygenetic, associated with both early and late magmatic stages. The formation of the bulk of rocks of gabbroid and ultra-basic composition and also associated iron-titanium mineralisation is determined by the processes of re-concentration of components (magnesium, iron and titanium) in the course of granitisation and phosphorus supply.

The process of ore formation occurred in two stages, whose main characteristic were a presence or considerable concentration of phosphorus. These stages are:

- Apatite-magnetite-ilmenite stage; and
- Ilmenite-magnetite stage.

Associated with the ilmenite-magnetite stage is the formation of:

- Poorly disseminated ilmenite-magnetite and magnetite-ilmenite in metagabbroids;
- Disseminated and densely-disseminated ilmenite-magnetite ores in the rocks of ultra-basic composition, pyroxenites and hornblendites;
- Poorly veined ilmenite-magnetite ores in "gabbro-pegmatites"; and
- Massive ilmenite-magnetite (titanomagnetie) ores. According to the existing classification (Malyshev 1957), these can be attributed to late-magmatic stage.

The bulk of iron-titanium mineralisation in the Kuranakh Massive is concentrated in the form of bands hundreds of metres wide. These zones are formed along tectonic contacts of the massive with the enclosing rocks and represent sites of increased rock permeability. Within such zones the distribution of mineralisation is regulated by structural elements, mainly linear and annular. The latter are the most interesting targets for mineralisation. It is plausible that mineralisation in the vicinity of the Baltylakh region of Kuranakh is also a fragment of an annular-type structure. Within the massive, the mineralisation is exclusively controlled by structural elements. No ore bodies associated with stratification have been identified.

> ***WAI Comment:*** *A considerable insight into the regional geology has been gained by the long standing efforts of both the Soviet and IRC exploration programmes and consequently WAI considers that the overall geology is well understood.*

2.3.1 Deposit Types

Within the Kuranakh and Saikta Deposits three ore types have been distinguished:

- An ilmenite-titanomagnetite type in massive ores (massive lenticular and streaky congregations); and
- Titanomagnetite-ilmenite and titanomagnetite-hemoilmenite types (as disseminations, impregnations and pockets) in the gabbroids.

In the Deposits the first two types dominate. In the lower parts of the ore bodies, high sulphide contents (5 – 10%) are noted from borehole data.

DVIMS (the Far-East Branch of the All Russian Scientific Research Institute for Mineral Raw Materials — Moscow) studied samples from Kuranakh in 2004 and drew the following mineralogical conclusions:

"The massive-texture type ores are characterised by the dominance of titanomagnetite over ilmenite (1.5 – 1.8 times), whilst in gabbros this ratio is 1:1 (or the proportion of ilmenite slightly higher). The ilmenite and titanomagnetite content varies from 20% in gabbro, to up to 90% in massive-texture ores. The ilmenite of these ores is homogeneous for the most part, but sometimes spinel or haematite laminae that are unique to gabbro ores have been noted."

The ilmenite of the deposit contains on average 5.6% TiO_2, 0.11% V_20_5, 0.06% Cr_2O_3, and 0.6% MnO and 1.6% MgO.

The titanomagnetite contains a small amount of thin laminate of ilmenite, spinels and ulvospinel and is characterised by the following contents: up to 10.5% (5% on the average) TiO_2, up to 1.8% (1.0% average) V_2O_5 and up to 1.3% Cr_2O_3. The titanomagnetite is also characterised by isomorphous replacements. The magnetite has a low Curie point (T = 545 – 555°C), which is indicative of the presence of isomorphous admixtures (up to 1 – 1.5% Ti, V) in its structure.

On average the ordinary disseminated ores contain about 8 – 10% TiO_2, whilst the TiO_2 content of the richer massive ores may amount to 13 – 20%.

Representative Processing Sample No. 8 taken in 2003 was analysed by DVIMS in 2004, the general chemical composition of the ore is given in Table 2.2.

Table 2.2: Chemical Composition of Ore (Sample No. 8) (DVIMS 2004)

Oxide	(%)
Fe_{total}	37.52
V_2O_5	0.46
TiO_2	12.50
SiO_2	19.1
Al_2O_3	9.49
MgO	1.98
CaO	2.02
MnO	0.19
K_2O	1.2
Na_2O	0.8
Au	0.34 g/t
Other impurities	2.32
Cr_2O_3	0.42
Pb	< 0.1
P_2O_5	0.042
As	< 0.1
CO_2	< 0.1
Ni	0.028
Zn	0.042
Co	0.086
Cu	0.024
H_2O	0.21
S_{total}	0.025

A second representative sample comprising "Process Sample 6 taken from Trench 26 and Borehole 26, situated in the central part of the Saikta Ore Zone No.3" was studied by DVIMS in 2004. The source of this sample is thought to represent mainly massive ore (55%) with some disseminated ore (30%) and host rock (15%). The main minerals identified in the sample were magnetite, ilmenite, and plagioclases. Other minerals included amphiboles, pyroxenes, garnet and biotite, secondary minerals accounting for 10-15% of the total sample volume.

The chemical composition of Sample 6 is given in Table 2.3.

Table 2.3: Chemical Composition of the Ore
Source: Results of DVIMS 2004 Study
Oxides (%)

SiO_2	TiO_2	Al_2O_3	Fe_2O_3	FeO	CaO	MgO	MnO	P_2O_5
21.26	11.3	10.07	24.0	23.47	2.50	0.5	0.15	0.02

SO_3	K_2O	Na_2O	Cr_2O_3	H_2O-	Other imp.	Σ	V_2O_5
0.14	0.62	2.92	0.5	0.28	2.30	100.03	0.15

The results of semi-quantitative spectral analysis of this ore are presented in Table 2.4.

Table 2.4: Spectral Analysis of Sample 6
Source: Results of DVIMS 2004 Study

Ref. No.	Element	Content, %	Ref. No.	Element	Content, %
1	Calcium	0.6	13	Copper	0.006
2	Silicon	>3.0	14	Lead	—
3	Aluminium	>1.0	15	Silver	—
4	Magnesium	0.8	16	Zinc	0.06
5	Iron	>10.0	17	Tin	0.004
6	Magnesium	0.06	18	Sodium	>1.0
7	Nickel	0.01	19	Potassium	—
8	Cobalt	0.004	20	Molybdenum	0.0004
9	Titanium	>1.0	21	Gallium	0.0008
10	Vanadium	0.3	22	Arsenic	0.08
11	Chromium	0.40			
12	Zirconium	0.006			

The mineral composition of Sample 6 crushed to 2mm is given in Table 2.5.

Table 2.5: Mineral Composition of the Ore (crushed to 2 mm)
Source: Results of DVIMS 2004 Study

Minerals and rocks	Content (%)
1. Useful components:	
Magnetite, titanomagnetite	35.24
Ilmenite	10.91
2. Main:	
Feldspars	16.75
Biotite	3.89
Amphiboles	4.41
Quartz	1.41
Garnets	0.87
3. Secondary:	
Apatite	0.045
Zircon	0.015
Graphite	0.11
Limonite	0.81
Sphene	Single trace
Leucoxene, epidote, limonite, olivine, haematite, graphite, chlorite, carbonates, tourmaline	Traces
4. Rare:	
Pyrite	0.004
Arsenopyrite	Traces
Chalcopyrite	Traces
Rutile	Single trace
Anatase	Single trace
Tourmaline, spinel, corundum, brown zircon, realgar, galenite	Single trace
Gold	13 traces
5. Magnetite in growths with other minerals	2.75
Ilmenite in growths with other minerals	0.47
Limonitised fine-grained micaceous rock	0.59
Rock (gabbro-anorthosites)	6.64
Iron scrub	Trace
6. Silts (quartz and feldspars)—fraction minus 0.071 mm	8.26
Total	**100.00**

DVIMS highlight that:

- The main ore minerals, titanomagnetite and ilmenite, account for 46.15% of ore mass. The ratio of titanomagnetite to ilmenite is 2.93;
- Titanomagnetite contains (%): 6.5 titanium oxide, 85.5 ferric oxide (III), up to 0.4 vanadium oxide (5), 0.02 chromium, 0.0002 molybdenum;
- Ilmenite contains (%): 48.6 titanium oxide, 54.0 ferric oxide;
- The presence of 13 traces of gold, of 0.01 to 0.5mm in size. Gold is diverse in shape: lumpy, isometric and from bright to dark-yellow in colour;
- Anorthosites and gabbro-anorthosites underwent granitisation and skarning in subsequent geological history; and

- Variability of the ilmenite composition along the strike of the ore field should be investigated in more detail.

WAI Comment: *From the presented and reviewed reports WAI considers that the ore mineralogy of the deposit is well understood.*

2.3.1.1 Density

The density is quoted as 3.63t/m^3 for the massive ores and 2.61-3.66t/m^3 for the disseminated ores (DVIMS, 2004).

The density value used for reserve determination is 3.63t/m^3 on a global basis.

2.3.1.2 Structure

Structural controls appear to play an important role in the geometry of the host rocks and known mineralisation of the Kuranakh Project and, importantly, dictate those areas that may represent sites for additional mineralisation.

Faulting plays a key role in structural control. Ore blocks are contained within a mosaic-block pattern determined by the intersection of several fault orientations. These faults are orientated in both a north-east–south-west, and approximately east-west and north-south direction. In relation to the general strike of the structure in the region, the former can be regarded as longitudinal, the other as diagonal, and the latter as transverse. The north-easterly and approximately east-west trending faults appear to be "feathering systems" in relation to the main Imangrakansky Fault Zone.

The dip of both the north-easterly and approximately east-west trending fault fissures is in a southerly direction at angles of 50-90° and may have vertical displacement of up to a hundred metres. Dislocations of the former type are frequently marked by dykes and veins of granites and pegmatites, mineralised metagabbroids and veins of massive ilmenite-magnetite ores. In a number of cases, these faults restrict the distribution of mineralisation along strike and dip, and ores are localised in the feathering systems. The approximately east-west trending faults are very common. Faults with an north-south orientation are transverse in relation to the above dislocation systems and are intersecting with respect to the latter and the ore bodies. The displacement along these upthrust faults can have vertical amplitude of hundreds of metres.

2.3.2 Mineralisation

The Kuranakh Project contains two major areas of mineralisation, namely (from west to east):

- Kuranakh Deposit (historically known as Ore Zone 3; now known as the South, Intermediate and North zones); and

- Saikta Deposit (containing Ore Zones 1, 2, 4 and 8 of which Ore Zone 1 is the largest).

To date, within the licence area, the mineralisation in the western part of the Kuranakh Deposit known as Kuranakh Ore Zone No. 3 has been studied most thoroughly.

Indicated and *Inferred* Mineral Resources in accordance with the JORC Code (2004) have been calculated for the Saikta Deposit, and reserves in categories B, C_1 and C_2 (in accordance with the Russian System) have been calculated for the Kuranakh Deposit. Details of the Russian System data have previously been published by the IRC Group.

The initial open pit is planned within this area. The ore bodies are hosted within medium-grained anorthosites and other gabbroids of Lower Archean age.

The main ore minerals are ilmenite and titanomagnetite. The main useful components include titanium and iron; other components include vanadium, chromium, nickel, and cobalt. Of these only vanadium is considered a useful by-product and is taken into account in the assessment of reserves.

2.4 Exploration, Drilling, Sampling and Data Verification

2.4.1 Historical Exploration

The Kuranakh Project was first explored by the Soviet exploration group Dalgeophysica from 1984-1988 and thereafter by Tynda Geological Expedition from 1986-1991, both of which undertook geological mapping, trenching and drilling. The majority of the work concentrated on Ore Zones 1 and 3. To date, no underground exploration activity, other than drilling, has taken place.

Most of the work carried out within the Kuranakh Project has been focused on the ore bodies situated on the west side of the Kuranakh Project area. This area has been explored extensively over the past 20 years and eight ore zones have been identified.

These discrete ore-bearing zones (Nos.1-8) have been located in an area of approximately 5km strike length in an ENE direction, over a width of approximately 1.5km. These are shown in Figure 2.4. The ore zones identified consist of sub parallel veins, together with streaky and lenticular bodies. The ore bodies generally strike ENE and dip steeply (70-80°) to the SE. Individual ore bodies range in length from several hundred metres to 2.3km and ores have been traced down to a depth of 200-250m from the surface. Of the eight ore bodies, only Kuranakh (Ore Zone 3) and Saikta (Ore Zone 1) have been considered as amenable to economic exploitation.

2.4.1.1 Kuranakh Deposit (Ore Zone 3)

The Kuranakh Deposit is an arcuate shaped ore body that outcrops on gently dipping southern slopes. It has a total strike length of 2.5km in a general NNE direction. The width of the ore zone is up to 70m. The dip is generally 70° to the S and SW, but can vary from 50° to vertical. A total of 9 individual ore bodies have been identified within the limits of the deposit.

Regis Geological Exploration Contractor ("Regis") (a wholly owned subsidiary exploration company of Petropavlovsk plc) has undertaken a series of detailed geological and geophysical studies of Ore Zone 3 (the Kuranakh Deposit). A plan of the magnetic anomalies identified for the same area is given in Figure 2.5, together with a typical cross section which is given in Figure 2.6. The definition of mineralised zones identified using this technique is considered by WAI to be technically robust.

The exploration works were undertaken in 3 stages;

- Geological survey;
- Estimation geological survey; and
- Exploration.

Exploration works were conducted through geological mapping surveys (at 1:50,000 scale), trenching, drilling, grab sampling, surface and core sampling. Historically, exploratory open pits have been dug across the strike of the deposit, including a large open works excavated by Amur Titanium, the first Soviet mining company to hold the licence.

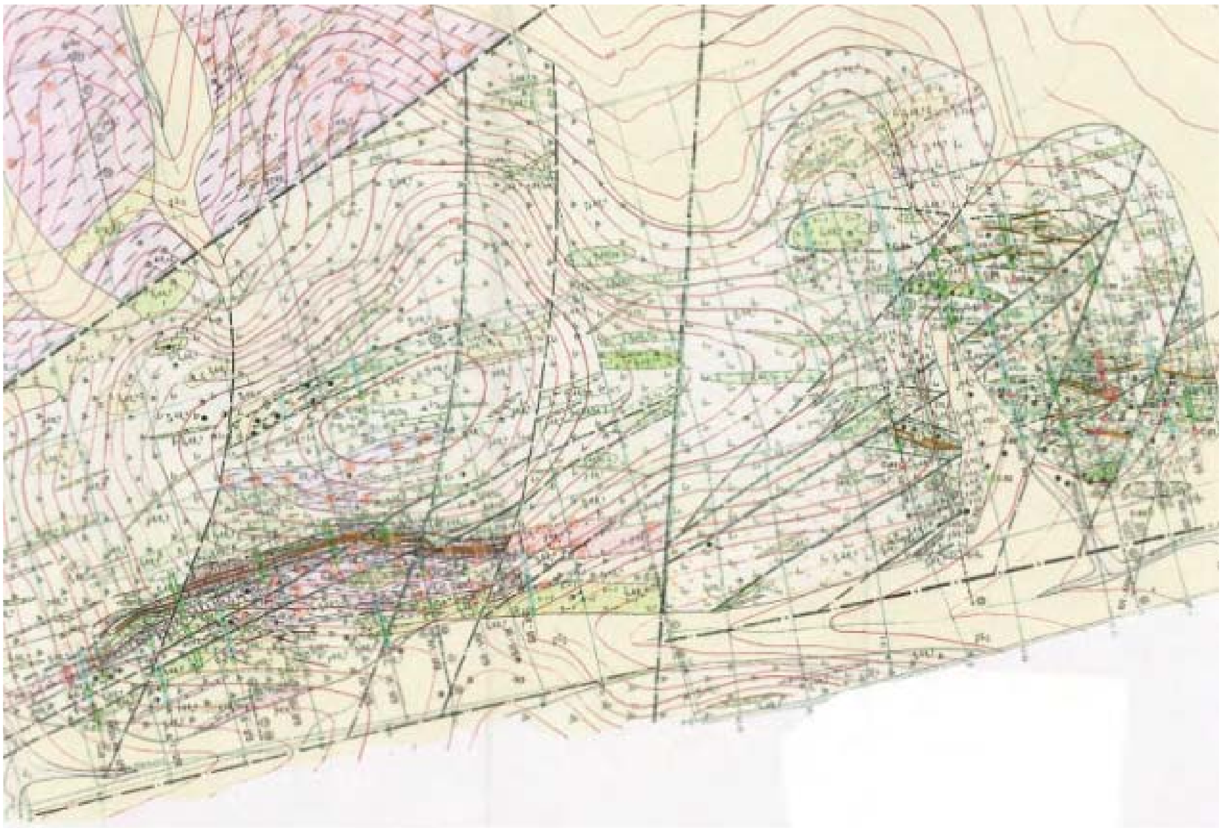

Figure 2.4: Plan of main Kuranakh Mineralised Ore Zones — showing Main Ore Zones 1, 2, 3, 4 and 8 — Kuranakh Project

Source: Provided to WAI by IRC during February 2010 site visit

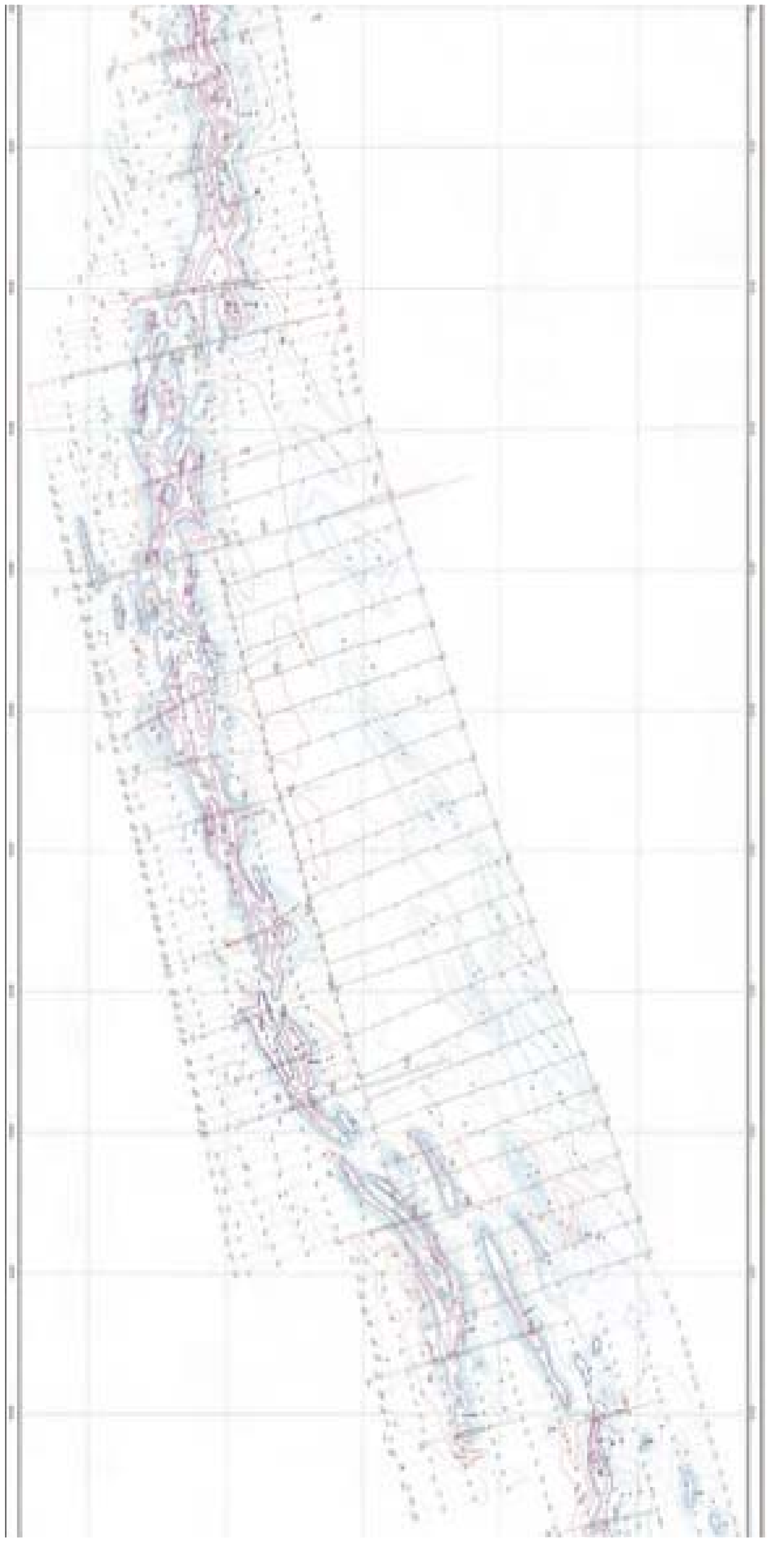

Figure 2.5: Plan of Ore Zone No.3 — Kuranakh Deposit—showing Magnetic Anomalies (200m between grid lines)

Source: Provided to WAI by IRC during February 2010 site visit

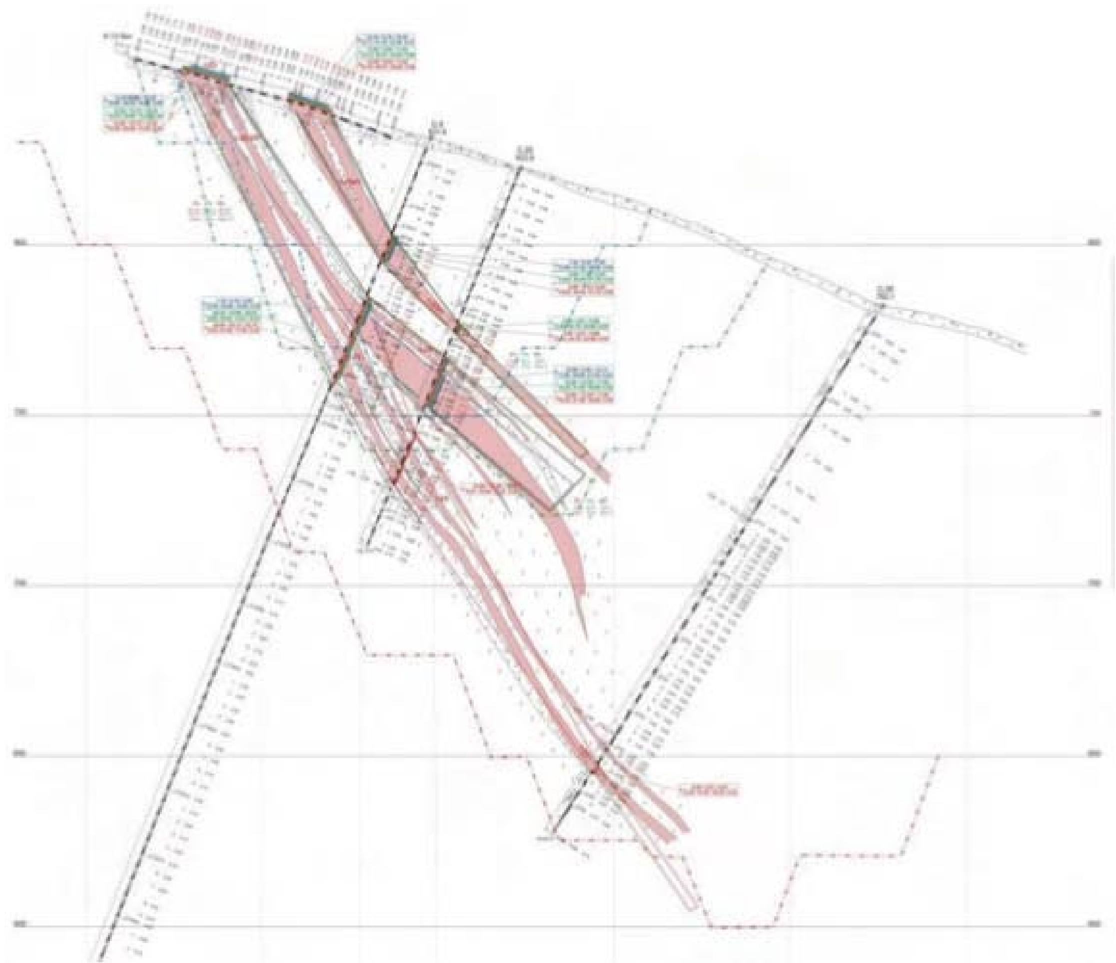

Figure 2.6: Typical Cross Section through the Central part of Ore Zone No.3 — Kuranakh Deposit (Grid lines at 50m spacing)

Source: Provided to WAI by IRC during February 2010 site visit

2.4.2 Drilling, Sampling Method and Approach

Site exploration (at Kuranakh and Saikta) was carried out on a grid pattern with a distance between profiles of 110-210m. The work included:

- Trenches (23 in total) dug at 100-200m intervals along strike, with a total length of trenching of 3,400m. The depth of the trenches varied from 2.5-6.5m, with an average depth of 3.1m. In total a volume of 42,700m^3 of trench was excavated;
- Drill profiles on a 110-200m spacing, with distance between drill holes along each profile being 60-100m and 20-50m in areas of greater ore concentration. 40 diamond drill holes have been completed totalling 4,370m. Down-the-hole gamma surveys were undertaken for each drill hole (which identified noticeably high gamma peaks for Zircon). A typical drill cross section through the centre of the ore zone is given in Table 2.6; and
- Ore grades have been identified in drill intersections to a maximum depth of approximately 250m (plane of lode from surface — POL). Typically, the main ore mineralisation structures appear to cut out and thin below a depth of 150m POL.

Figure 2.7 below shows the Drill and Trench plan for Ore Zone 3.

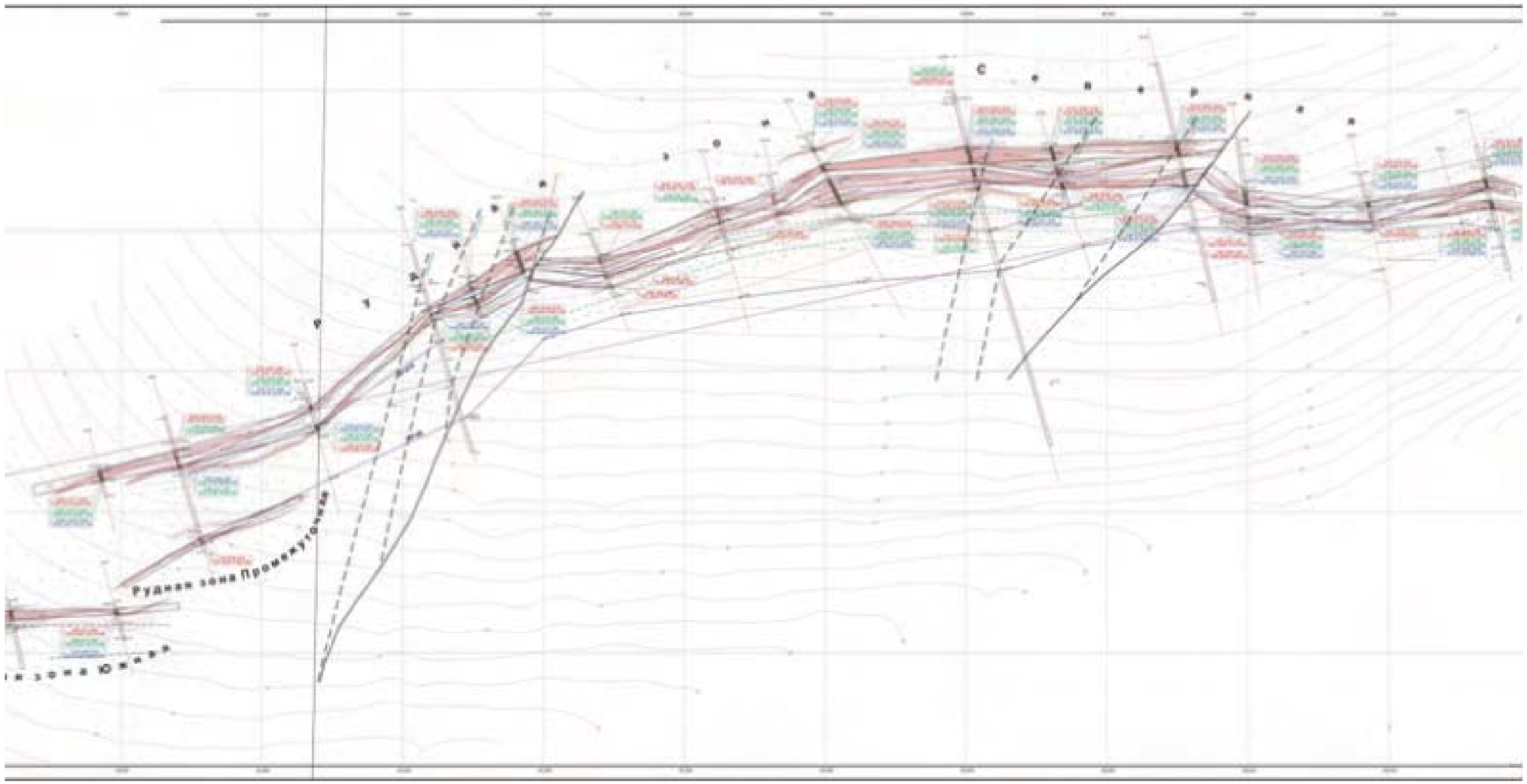

Figure 2.7: Drill and Trench Plan of Kuranakh Deposit (Ore Zone No.3) (200m between grid lines)

Source: WAI Feasibility Study Review Report 2008

In total, 1,007 trench samples, 1,367 core samples and 4 technological samples (three of 150kg and one of 1,500kg) were taken at the Kuranakh and Saikta ore sites.

In 2003, a 3t bulk sample (average grade of +7% TiO_2) was collected from the sites and sent for metallurgical testing at Ferrostaal in Germany. In 2004, a 5t bulk sample (Process sample No. 13 — average grade of +5% TiO_2) was also collected on the sites from Trenches 13, 24 and 26. The grade of the individual ore types in the sample is provided in Table 2.6 below.

Table 2.6: Composition of Bulk Sample No.13 (Ferrostaal, 2004)

	Content of Components in Bulk Sample (%)				Weight of sample material
Types of ore	TiO_2	Fe_{total}	Fe_{magn}	V_2O_5	(kg)
Trench No.13					
Massive	14.29	40.05	24.42	0.44	996
Nest	12.4	39.72	27.14	0.55	115
Disseminated	—	—	—	—	—
Granitised gabbro	1.32				89
Trench No.24					
Massive	17.04	52.87	41.06	0.58	1,305
Nest	—	—	—	—	—
Disseminated	7.43	25.08	14.83	0.30	847
Granitised gabbro	1.50				1,068
Trench No.26					
Massive	15.90	48.18	37.00	0.57	940
Nest	—	—	—	—	—
Disseminated	—	—	—	—	—
Granitised gabbro	0.64				210
Total					**5,570**

Note: *Ferrostaal, 2004*

> ***WAI Comment:*** *WAI have inspected only a small proportion of the most recent core intersections from the sites. The majority of the half Fe core intersections were sent to a laboratory at Ulan Ude for analysis. The remainder have been kept in storage.*
>
> *It is understood that core recovery was very good. WAI considers that this is a fair assumption given the massive and competent nature of both the host rock and the mineralised zones.*
>
> *Similarly trenches and borehole collars were observed in the field and appear to correlate well with their location on plans and sections provided.*

2.5 Mineral Resources

2.5.1 Kuranakh Deposit

IRC has reported the Kuranakh Deposit resources only in accordance with the Russian System.

Three ore zones have been identified at the Kuranakh Deposit as follows (see Figure 2.8):

- South Zone;
- Intermediate Zone; and
- North Zone.

Figure 2.8: Location of the South, Intermediate and North Ore Zones within Kuranakh Deposit

Source: Provided to WAI by IRC during February 2010 site visit

2.5.2 Saikta Deposit

The mineralisation at the Saikta Deposit comprises tabular steep dipping bands and lenses of massive and disseminated titanomagnetite hosted by gabbro and andesite. These bands form the ore zones. Seven ore zones were identified at the Saikta Deposit as follows: 1, 2, 4, 5, 5A, 6 and 8 (Figure 2.10). The strike length of the individual bands varies from 100-700m with an average thickness from 7 to 25m. Their down-dip extent has been proven up to a depth of 300m from the surface. The bands normally have sharp contacts with the host rocks. A typical cross section though ore zone 1 is shown in Figure 2.9 below.

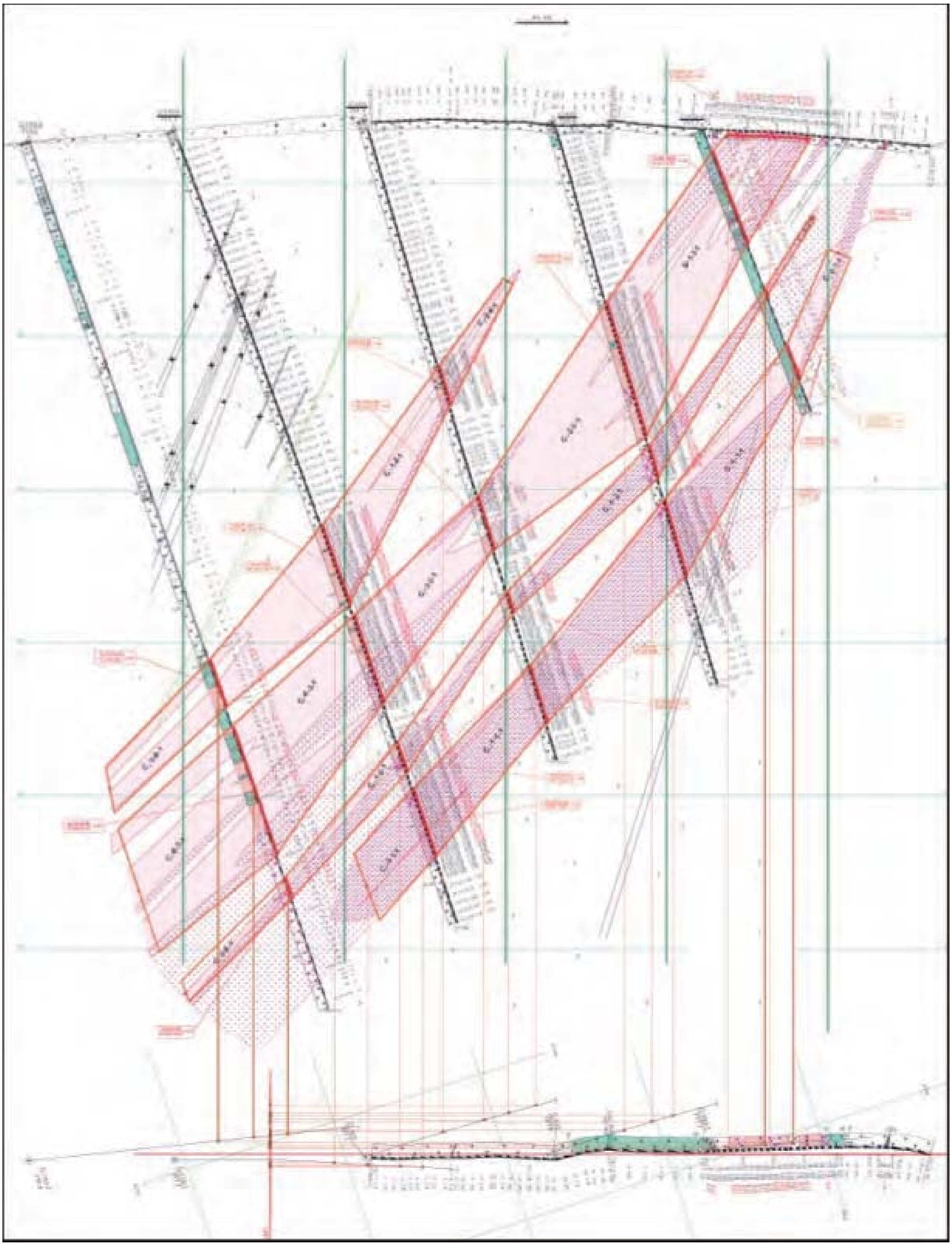

Figure 2.9: Typical Cross Section through Saikta Ore Zone 1
(Grid lines at 200m spacing)

Source: Provided to WAI by IRC during February 2010 site visit

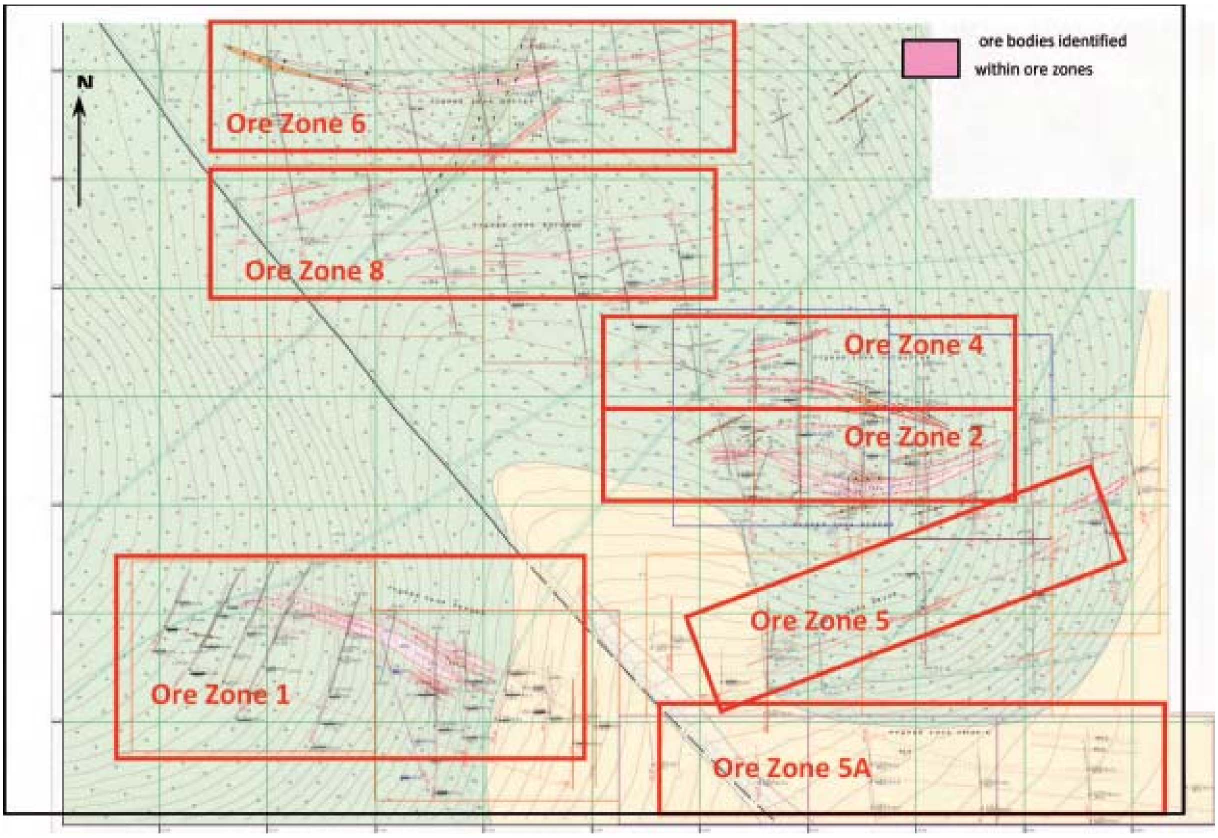

Figure 2.10: Ore Zones Location within Saikta Deposit

Source: Provided to WAI by IRC during February 2010 site visit

2.5.3 Saikta Deposit Mineral Resource Estimate

A Mineral Resource estimate was produced by WAI for the Saikta Mineralised Body 1 in 2008. The modelling and estimations produced have been based upon the data provided by IRC, using historical and more recent drilling data, sections, plans, reports, and previous resource models. The sections and plans aided in the definition of the mineralised envelope during the modelling process.

2.5.3.1 Resource Estimate

The Mineral Resource estimate for the Saikta Deposit, carried out in accordance with the guidelines of the JORC Code (2004), is presented in Table 2.7 below.

Table 2.7: Saikta Mineral Resources
In accordance with the guidelines of the JORC Code (2004) — 17% Fe_{Total} C.O.G.

Resource Classification	Mineral Resources	Fe_{Total}	Fe_{Magn}	TiO_2	Fe_{Total}	Fe_{Magn}	TiO_2
	(Mt)	*(%)*	*(%)*	*(%)*	*(Mt)*	*(Mt)*	*(Mt)*
Indicated	21.663	30.82	20.26	9.58	6.677	4.389	2.075
*Inferred**	0.011	22.22	12.40	11.22	0.002	0.001	0.001

Note: Mineral Resources are presented as of 01 September 2008. As no ore extraction took place and no resource/reserve update has been performed since that date, the above statement remains valid as at the date of this CPR.

* For a description of the categories of *Measured*, *Indicated* and *Inferred* JORC-Compliant Mineral Resources, and the level of confidence attributable to each category, please refer to the section headed "Classification of Geological Resources and Reserves — Reporting of Mineral Resources in accordance with the JORC Code (2004)" in this report.

The Mineral Resources for Saikta Mineralised Body 1 were estimated from the Datamine® block model and were calculated, in accordance with the guidelines of the JORC Code (2004), to a cut off grade of 17% Fe_{total} as requested by IRC.

The Mineral Resource estimate for a 17% Fe_{total} C.O.G. yielded 21.663Mt of *Indicated* Mineral Resources at 30.82% Fe_{total} and 20.26% Fe_{mgn}, and a further 11,206t of *Inferred* Mineral Resources at 22.22% Fe_{total} and 12.40% Fe_{mgn}. Again, TiO_2 was included into the resource estimation with a grade of 9.58% and 11.22% for *Indicated* and *Inferred* Mineral Resources respectively.

> ***WAI Comment:*** *WAI was informed by IRC that no Mineral Resource update has been performed for Saikta since WAI's 2008 estimate, and that no mining has taken place at the site. As such, WAI considers that this data remains valid as at the date of this report and that the Mineral Resource statement, presented above, should be considered current.*

2.6 Ore Reserves

In May 2010, IRC updated the ore reserve statement prepared in accordance with the Russian System for the Saikta Deposit, using updated commodity prices of US$104 per tonne of titanomagnetite concentrate and US$110 per tonne of ilmenite concentrate. The Russian System data has previously been published by the IRC Group. A reconciliation of the Russian System data in accordance with the JORC Code (2004) has not been possible.

The Saikta open pit, which is to be mined in 2010, has the following parameters:

- Length — 980m;
- Width — 480m;
- Depth — 365m.
- Bench height — 10m;
- Berm width — 8 – 10m, every 30m.

Stripping works at Saikta started to be realized in late 2008.

No pit parameters have yet been presented for the Kuranakh open pit as this is not expected to be operational until 2018 at which point it will be necessary to revisit the pit design parameters to take account of the economic climate at that time. It has not been possible on the information available to prepare an Ore Reserve Statement in accordance with the JORC Code (2004) for the Kuranakh Deposit.

2.7 Mining and Infrastructure

2.7.1 Introduction

The Kuranakh Project is a production-stage iron ore project with open pit mining activities in place. The Kuranakh Project will exploit both the Saikta and Kuranakh Deposits, producing titanomagnetite and ilmenite concentrates at the Olekma processing plant.

2.7.2 Current Activities

Mining at the Kuranakh Project commenced in late 2008, when the Saikta open pit began operating. Preliminary trial mining took place in October-December 2008 with subsequent trial processing. A total of 100.5kt of ore was mined in 2008, and 52.5kt in 2009. Mining during 2009 focused on stripping works, rather than ore mining, as the processing plant was not operational.

During this period, benches at the 730-700m levels were mined at the Saikta pit, with some additional development taking place at the 690-670m levels. The amount of waste mined in 2009 was 1.4Mm^3. Ore extracted from the Saikta pit during 2009 was stockpiled adjacent to crushing and screening plant until the crushing plant operations re-commenced in March 2010. As of 31 December 2009, approximately 0.120Mt of ore from the Saikta pit had been stockpiled to date.

Full-scale mining and ramp up to production commenced in May 2010. Mine planning suggests an annual mining rate of 2.6Mt once full production is reached, which is expected to be by the end of 2010, in addition to an average of 3.6Mm^3 of waste which will be mined each year. The Kuranakh Project life of mine production schedule is shown in Table 2.8 below.

Table 2.8: Kuranakh Project Life of Mine Schedule

	Units	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Saikta (Open Pit 1)																
Ore Mined	Mt	0.9	2.60	2.60	2.60	2.60	2.60	2.60	2.60	1.81	—	—	—	—	—	—
Waste	$M.m^3$	1.258	3.64	3.64	3.64	3.64	3.64	3.64	3.64	2.53	—	—	—	—	—	—
Fe_{total}	%	26.6	30.0	29.5	29.5	29.5	29.5	29.5	29.5	29.5	—	—	—	—	—	—
TiO_2	%	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1	—	—	—	—	—	—
Fe_{total}	Mt	0.44	0.78	0.77	0.77	0.77	0.77	0.77	0.77	0.23	—	—	—	—	—	—
TiO_2	Mt	0.17	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.18	—	—	—	—	—	—
Kuranakh (Open Pit 3)																
Ore Mined	Mt	—	—	—	—	—	—	—	—	0.79	2.60	2.60	2.60	2.60	2.60	1.77
Waste	M^3	—	—	—	—	—	—	—	—	1.47	4.81	4.81	4.81	4.81	4.81	3.28
Fe_{total}	%	—	—	—	—	—	—	—	—	34.4	34.4	31.8	30.3	29.9	29.7	29.0
TiO_2	%	—	—	—	—	—	—	—	—	10.4	10.4	10.4	10.4	10.4	10.4	10.4
Fe_{total}	Mt	—	—	—	—	—	—	—	—	0.27	0.89	0.83	0.79	0.78	0.77	0.51
TiO_2	Mt	—	—	—	—	—	—	—	—	0.08	0.27	0.27	0.27	0.27	0.27	0.18
Total Ore Mined	**Mt**	**0.9**	**2.60**	**2.60**	**2.60**	**2.60**	**2.60**	**2.60**	**2.60**	**2.60**	**2.60**	**2.60**	**2.60**	**2.60**	**2.60**	**1.77**
Titenomagnetite Concentrate	**Kt**	**184**	**936**	**920**	**920**	**920**	**920**	**920**	**920**	**967**	**1,073**	**992**	**944**	**933**	**927**	**617**
Ilmenite Concentrate	**kt**	**47**	**301**	**297**	**297**	**297**	**297**	**297**	**297**	**312**	**346**	**320**	**304**	**301**	**299**	**199**

2.7.3 Mining Equipment

The Saikta Deposit is mined using conventional truck and shovel ore extraction techniques, employing a combination of western- and CIS-manufactured equipment. The geometry and nature of the orebodies are suitable for bulk mining and it is anticipated that selective mining techniques will not be required. All ore and waste will require drilling and blasting.

At the time of the WAI site visit in February 2010, the following major mining equipment was observed at the Saikta site:

- 2 x Atlas Copco DML-HP-E and 1 x ROC L8 drill rigs, used for blast hole preparation;
- 5 x EKG-5A electric shovels (1 under assembly) employed both for ore and waste excavation; and
- 15 x Cat775 articulated trucks for ore and waste transportation.

A number of auxiliary machines (including as 2 x T-35.01 dozers, 1 x Cat D9R dozer, and D3-98.V1 graders, an explosive mixing and distribution vehicle, and personnel transport vehicles) facilitate ore and waste extraction and provide road construction and maintenance, bench preparation, and other important secondary services.

> ***WAI Comment:*** *WAI considers that the mine has the required plant and equipment, and is capable of meeting the production plan as outlined above.*

2.7.4 Mining Infrastructure

The main items of infrastructure associated with the mining operations are:

- Access road to the site;
- Power supply;
- Explosives store;
- Maintenance workshops;
- Fuel storage depot;
- Coal boiler house;
- Weighing bridges; and
- Primary crushing and screening plant.

During the site visit, it was noted that the access road, power supply, explosives store, coal boiler house, maintenance workshops and fuel depot were all completed. The primary crushing and screening plant was commissioned and operational as of the February 2010 site visit.

> ***WAI Comment:*** *All necessary infrastructure is in place to allow mining, crushing and screening to commence in line with the production plan.*

2.7.5 Transportation

Transportation to and from the Kuranakh Project site will be via either road or railway, and is connected with the Olekma Railway Station and Olekma Settlement by a 41km long, Category IV (a Russian standard classification) motor road.

All supplies will be brought to the Kuranakh Project site using the BAM railway and off loaded at Olekma spur line. The concentrate will be delivered to the Olekma station by rail.

The volume of transportation between the Kuranakh Project site and the transhipment terminal in Year 5 of operations is provided in Table 2.9 below.

Table 2.9: Rail Transport Utilisation

Freight /Cargo Handling	Tonnes to be Handled per Year
Incoming	
Metal Equipment	60
Spare Parts for Vehicles, Open Pit and Process Equipment	420
Technical materials	350
Explosives	3,000
Packaging	70
Construction Materials	150
Coal (for Heating Plant)	3,000
Fuels + Lubes:	
—Diesel	7,595
—Petrol	284
Food and Consumer Goods	100
Other Cargo	145
Total	15,174
Outgoing	
Concentrate	1,200,000
Domestic Waste	630
Metal waste, production waste, used tyres	70
Reusable Containers	5
Total	1,200,705
Overall	
Total Incoming + Outgoing	1,215,879

Note: *IRC, 2010*

At the time of the WAI visit to the site in February 2010, the railway line between Olekma station and processing facilities was partially completed. As at the date of this CPR, the railway line is complete and operational.

2.8 Mineral Processing & Metallurgical Testing

2.8.1 Introduction

The Kuranakh Project contains magnetite, titanomagnetite and ilmenite as economic minerals and hornblende, garnet, feldspar, pyroxene and biotite as gangue mineralisation.

The Kuranakh & Saikta Deposits comprise three distinctive ore types, namely:

- Massive Ores;
- Pocket and Vein ores; and
- Finely disseminated ore.

It is reported that the ore types are characterised as having essentially the same mineral and chemical composition and are amenable to processing via a single metallurgical flowsheet. Chemical analysis indicates that the Kuranakh and Saikta Deposits have a head grade of 31.8% Fe, 12.5% TiO_2, around 0.5% Cr_2O_3 and V_2O_5 and is low in sulphur and phosphorus.

2.8.2 Process flowsheet

2.8.2.1 General

The processing of ore from the Kuranakh Project is a two stage operation, consisting of crushing and magnetic pre-concentration initially at the Saikta and Kuranakh mine sites followed by further beneficiation at the Olekma concentrator.

2.8.2.2 Crushing and Pre-concentration

The crushing and pre-concentration plant is designed to treat 2.6Mtpa of ore and produce 1.8Mtpa of pre-concentrate.

Ore, at a nominal size of -1,000mm is delivered to a stockpile area by Cat 773 trucks. The material is fed to a jaw crusher from where it is crushed to pass 200m and conveyed to a stockpile. Ore is recovered via one of two underground sub-grade feeders and is further crushed in two parallel lines consisting of 2 x 200mm, secondary cone crushers.

The secondary crushed product is screened at 10mm and the screen undersize reports as the final product. The -60 +10 fraction undergoes dry magnetic separation to produce a magnetic product and a non-magnetic tailings product.

The magnetic concentrate is stockpiled before being conveyed to tertiary cone crushers where the material is crushed to -30 mm. The crushed product is again screened at 10mm and the -30+10mm fraction is treated by a second stage of dry magnetic separation. The magnetic concentrate is re-circulated to the tertiary crusher and the non-magnetic product is conveyed to the tailings stockpile.

The two -10 mm product streams are then combined and shipped to the Olekma processing plant for beneficiation. IRC predict that the pre-concentration stage will result in an increase in Fe grade to 39.4% Fe at an iron recovery of 96.4% (mass pull of 71%), and equivalent data for TiO_2 suggests that grades will be raised to an average grade of 13.4% TiO_2 at a recovery of 97.5%.

2.8.3 Current Status

The crushing and pre-concentration plant was operated for a brief period in 2008, from October to December. A total of 64,458t was treated through the plant. The head grade of the material treated was not determined and a figure of 30.8% Fe (average deposit grade) was assumed. A total of 13,540t of concentrate assaying 39.6% Fe was produced and 5,854t were sold to a Chinese customer as low grade product. Production ceased due to the lack of a market for the product.

When the plant operated in 2008 (prior to operations ceasing in December 2008) it did so using only the jaw crusher and coarse cone crusher to give a -60mm product. The -60mm product was screened at 10mm and the -10mm was passed through the magnetic separator to produce a final concentrate. The +10mm fraction and the tailings from the magnetic separator were stockpiled and were fed through the plant when it resumed operation in May 2010.

> ***WAI Comment:*** *WAI did not have the opportunity to make a detailed inspection of the plant. The tonnage treated suggested that the plant was still in the early stage of commissioning. IRC has advised WAI that the plant is now fully commissioned and operational.*

The second beneficiation stage at the Olekma processing plant is designed to produce two separate titanomagnetite and ilmenite concentrates.

The -10mm pre-concentrate is dumped onto a stockpile and recovered using sub grade feeders. The material is conveyed to a ball mill and the ground product passes to a spiral classifier with the classifier sands being returned to the ball mill. The spiral classifier overflow is pumped to Derrick screens and the screen oversize is returned to the ball mill. The final product size is 100% passing 300μm.

The screen undersize is pumped to one of nine low intensity two-stage magnetic separators (LIMS) operating in parallel. After thickening, filtration and drying, the magnetic products will be shipped as a final product containing 62.5% Fe (at an iron recovery of 71.3%).

The LIMS tailings are then beneficiated by wet high intensity magnetic separation to recover an ilmenite concentrate. The non magnetic product is pumped to one of six wet high intensity magnetic separators (WHIMS) operating at 4,000 Gauss. The WHIMS tailings are pumped to a tailings dam.

The ilmenite concentrate is thickened, filtered and dried and then subjected to two stages electrostatic separation to achieve a final grade of 48.7 % TiO_2 at a TiO_2 recovery of 56.4 %. The electrostatic plant is extensive, with 19 units being utilised.

The ilmenite concentrate will be sold in 2t bulk bags.

> ***WAI Comment:*** *The Olekma processing plant was under construction during the WAI site visit in February 2010, with progress having been slow during H1 2009. The plant was fully commissioned and operational in May 2010.*

2.9 Capital and Operating Costs

2.9.1 Forecast Operating Costs

The life of mine operating costs for the Kuranakh Project operations have been estimated by IRC and are summarised in Table 2.10 below.

Table 2.10: Summary of Kuranakh Project Life of Mine Operating Costs

Cost	Unit	Total Cost	Cost/Unit US$/t	Cost/Tonne Ore US$/t
MINING				
Total Ore Mined	t	36,480,300		
Total Waste Mined	m^3	59,075,409		
Variable costs—ore	US$	31,321,695	0.86	0.86
Fixed costs—ore	US$	23,044,671	0.63	0.63
Variable costs—waste	US$	160,646,838	2.72	4.40
Fixed costs—waste	US$	126,334,133	2.14	3.46
Total Mining	***US$***	***341,347,338***		***9.36***
PRIMARY PROCESSING				
Total Primary Concentrate Produced	t	25,710,421		
Total Primary Processing	***US$***	***61,532,068***		***1.69***
PRIMARY CONCENTRATE TRANSPORT				
Total Primary Concentrate Transported	t	25,710,421		
Total Transport	***US$***	***92,531,619***		***2.54***
SECONDARY PROCESSING				
Total Fe Concentrate Produced	t	13,094,985		
Total Ti Concentrate Produced	t	4,206,919		
Variable costs—Fe concentrate	US$	53,688,347	4.10	1.47
Variable costs—TiO_2 concentrate	US$	72,545,713	17.24	1.99
Fixed costs—Fe concentrate	US$	54,701,902	4.18	1.50
Fixed costs—TiO_2 concentrate	US$	19,665,481	4.67	0.54
Other fixed processing costs	US$	28,342,534	1.64	0.78
Total Secondary Processing	***US$***	***228,943,977***		***6.28***
CONCENTRATE RAIL TRANSPORT				
Total Fe Concentrate Transported	t	13,094,985		
Total Ti Concentrate Transported	t	4,206,919		
Rail transport—Fe	US$	265,241,639	20.26	7.27
Rail transport—TiO_2	US$	311,827,961	74.12	8.55
Total Rail	***US$***	***577,069,600***		***15.82***
G&A and ENVIRONMENTAL				
G&A	US$	72,389,410		1.98
Environmental	US$	6,059,638		0.17
Total G&A and Environmental	***US$***	***78,449,049***		***2.15***
TOTAL OPERATING COSTS	**US$**	**1,379,873,650**		**37.83**

* This table has been populated using data provided by IRC in the May 2010 update of the project cost model.

The operating costs in Table 2.10 are divided into fixed and variable costs and are presented as a total cost over the life of the Kuranakh Project, per unit produced or transported, where appropriate, and as unit cost per tonne of ore mined for comparative purposes. Non-income taxes such as mineral extraction tax and property tax are excluded from the table but amount to a further US$56M or US$1.53 per tonne of ore mined.

The cash operating costs are also presented by category in Table 2.11 below.

Table 2.11: Kuranakh Project Life-of-Mine Cash Operating Costs by Category

Operating Cost Category	Total Cost[(2)]	Cost per tonne of Ore Mined	Cost per tonne of Concentrate Sold
	US$	*US$/t*	*US$/t*
Workforce employment and Transportation of workforce[(1)]	341,347,338 (Mining)	9.36 (Mining)	19.73 (Mining)
Consumables (including fuel oil)	383,007,663 (Processing)	10.50 (Processing)	22.14 (Processing)
Power, water and other services			
On and off-site administration	72,389,410	1.98	4.18
Environmental protection and monitoring	6,059,638	0.17	0.35
Product marketing and transport	577,069,600	15.82[(3)]	33.35
Non-income taxes and royalties, and contingencies[(4)]	55,952,667	1.53	3.23
Total Operating Costs	**1,435,826,317**	**39.36**	**82.99**

Note: Costs per tonne are based on life-of-mine tonnages from the mining schedule.

(1) Due to the relationship between workforce employment cost, and workforce transportation costs, "transportation of workforce" costs have been combined as shown.
(2) This table has been populated using data provided by IRC in the May 2010 update of the project cost model.
(3) The cost is given inclusive of TiO_2 concentrate transportation
(4) The IRC Cost Model (May 2010) presents costs for these items but no further breakdown between them.

WAI Comment: *Mining of ore and waste rock and concentrate transport account for the majority of the operating costs. Within the mining costs, fuel oil for the truck fleet and other consumables such as explosives and maintenance materials are the main areas of expenditure. While still significant, labour costs are relatively low when compared with major mining operations (cf Western Europe, USA, Canada and Australia). Overall, WAI is of the opinion that the Kuranakh Project operating cost forecasts have been prepared in a diligent manner and the majority of the costs are based on either direct quotations from suppliers (in the case of rail transport) or through IRC's existing operating experience within the Amur Region.*

2.9.2 Capital Expenditure Plan

The majority of the capital expenditure required to develop the Kuranakh Project and associated facilities has already been committed and the full scale ramp up to production commenced in May 2010.

Some capital expenditure is required during 2010 for final construction and commissioning of the plant and mining equipment for the Saikta Deposit. The outstanding capital expenditure requirements are currently estimated as US$10M for the second half of 2010 and US$6M for 2011.

2.10 Environmental Issues

2.10.1 Review of Environmental & Social Studies

WAI was commissioned to undertake an annual review of environmental, social and health and safety issues relating to the development of the Kuranakh Project held by IRC with a site inspection, data review, analysis and provision of recommendations where necessary. The broad aim of the review was to establish whether or not the project is in compliance with environmental and socio-economic commitments and relevant legislation and guidelines both on the national and international levels.

Between 2004 and 2007, preceding the development of the deposit, extensive baseline studies on the following media have been carried out by IRC:

- atmospheric air;
- surface waters;
- soils;
- bottom sediments (bed silt);
- presence of archaeological, cultural or historical heritage;
- presence of sites of special geological or scientific interest or other specially protected areas;
- socioeconomic studies, including the indigenous peoples and local communities; and
- radioactivity assessments.

The results of these studies were submitted to the Russian State for expert comment which was subsequently approved by Rosgidromet Federal Agency. The environmental baseline levels have been accepted as background conditions within the development areas and the sanitary protection zones. Supplementary baseline information will continue to be gathered as mine development progresses, in line with international good practice.

An independent EIA was undertaken on behalf of IRC in 2006. The EIA report documents baseline environmental and social data collected by local consultants and assesses potential impacts arising from construction, operation and eventual closure.

In accordance with Russian Federation legislation, the design documents for construction and location of facilities are subject to State expertise and are to incorporate the findings of an EIA. The mining and processing project designs have received individual approvals, as follows:

- positive conclusion of the Russian State expertise (No 054-10/GGE-5572/15);

- positive conclusion No 361 of the Russian State ecological expertise for the Kuranakh Mine Design (approved by Rosprirodnadzor for the Amur Region on 29.12.2006, No 698).

- positive conclusion No 362 of the State ecological expertise for the Kuranakh Processing Design (approved by Rosprirodnadzor for the Amur Region on 29.12.2006, No 701).

A programme of public consultation was also initiated as part of the preparation of the EIA. The EIA was audited by SRK, as independent consultants, in March 2007 and considered to be adequate. SRK endorsed the scope and format of the EIA and considered that, 'although there have been changes in the Equator Principles and the introduction of IFC Performance Standards since the report was submitted, it nevertheless remains an adequate assessment of the predicted environmental and socials impacts'. SRK further considered that 'the EIA is broadly in compliance with latest Equator Principles at which time Aricom expressed commitment to address compliance with the updated Equator Principles, through the development and implementation of an environmental management plan, a public consultation and disclosure plan and an environmental/social action plan.'

The EIA contains an Environmental, Health and Safety Plan in addition to a Closure and Rehabilitation Plan.

WAI Comment: *WAI considers that the results derived from the baseline studies are comprehensive and do not indicate any areas of inherent concern in the existing environmental background conditions. The methodology adopted by IRC for the baseline studies is sound, well conducted and to a high standard with the samples analysed in the accredited laboratory.*

Monitoring of the sensitive aqueous environment, snow, soil and atmospheric air is ongoing constantly. To this end, the background data have been incorporated into the approved EIA. WAI has been provided with the necessary Russian State (Rospriradozor's) conclusions for review and finds that those are positive and do not identify any areas of high environmental risks. The approvals obtained do not introduce any onerous or impractical conditions on the project development.

Furthermore, WAI has reviewed the EIA and considers that it addresses the key issues likely to arise from the project as finally designed and adequately addresses the IFC objectives. Minutes of the public consultations, as reviewed by WAI, point to the unanimous concord demonstrated by the local communities towards the development of the Kuranakh Project.

2.10.2 Review and Comment on Key Environmental and Social Issues

2.10.2.1 Permitting Status

Land use around the project site is predominantly classified as forestry with some deer pasture. Exploration and construction operations have inevitably caused disturbance to the land.

Pursuant to existing legislation, the Kuranakh Project is required to conduct its exploration, construction and exploitation activities in accordance with the relevant laws and regulations governing land use and obtain necessary permits and approvals from the relevant regional and federal authorities.

The use of land at the Kuranakh Project is governed by eleven lease agreements governing separate land and forestry areas. The registry of these agreements has been provided to WAI for review in order to demonstrate the existing land use arrangements of the land/forest areas.

The following project design documents are available:

- Design for mining of the Kuranakh and Saikta Deposits which has passed all necessary approvals and the Russian State expert consideration, and

- Design for processing of the Kuranakh and Saikta Deposits and producing the titanomagnetite and ilmenite concentrates, for which numerous positive conclusions and experts' opinions at the local and regional levels have been granted. This design was submitted for Russian State expert consideration in May 2010. As of the date of publication of this report, the results are still awaited.

WAI Comment: *This information is subject to update by IRC, however WAI consider it is likely that the result will be positive given the number of consultations previously undertaken, and that should amendments be required they will be minor.*

In addition, detailed design for maximum allowable discharge levels (MADs), maximum allowable emissions (MAEs) and maximum allowable concentrations (MACs) has been prepared, based on the anticipated annual production figures. During the inventory process some 90 potential sources of pollution were identified. Analysis of concentration levels of the studied substances in the atmosphere has not revealed any elevated MACs in the sanitary-protection zone. However, those determinants which exceed 0.8MAC are subject to a continuous control. These, particularly NO_2 and inorganic dust, are reported to result from blasting operations and as such adequate mitigation measures are adopted by Olekminsky Rudnik. In this connection, the following list of permits obtained by Olekminsky Rudnik so far:

- Permit No 213 for discharges at the Kuranakh Project from 15 May 2008 to 15 May 2011 (no extension to this date has yet been obtained, however an application is to be submitted in Q1, 2011);

- Permit No 2 for discharges at the processing plant and the man-camp from 15 January 2009 to 15 January 2014;

- Permit No 25 for emissions from 01 April 2009 to 01 April 2014 for the Kuranakh Project;

- Permit No 26 for emissions from 01, 2009 to 01 April 2014 for the man-camp; and

- Permit No 52-04A/09 for emissions from 18 December 2009 to 18 December 2014 for the Kuranakh Project.

Moreover, conclusions for the waste management norms and disposal limits have been obtained for the following facilities:

- Man-camp (as of 01 June 2009);
- Kuranakh Project (as of 23 March 2009);
- Tynda Office (as of 09 July 2009); and
- Blagoveshchensk Office (as of 09 July 2009).

Furthermore, documents prepared for obtaining a licence on accumulation, use, detoxification, transportation and placement of wastes of hazard categories 1 – 4 as well as obtaining the limits for placement of wastes have been submitted to the Territorial Agency of the Federal Department for the ecological, technological and atomic control for approval, with positive results expected imminently (as of June 2010).

Approvals have been sought from the relevant statutory authority for construction of roads, and stream culverting. Approval for river crossings are in place.

It is worthwhile noting that from 2005 to date, no breaches of the Environmental Protection Legislation have occurred; Olekminsky Rudnik is reported to be wholly compliant with the environmental protection requirements of the Russian Federation Legislation.

IRC is currently aligning its sustainability reporting with the requirements of the Global Reporting Initiative (GRI). Consequently, a system of quantitative Key Performance Indicators ("KPIs") has been introduced, to be used for the reporting of environmental performance across company operations. KPIs for 2009 are in the course of preparation and will be reported in the 2009 Sustainability Report due in H2, 2010.

> ***WAI Comment:*** *WAI has viewed the approvals for the Mine and Processing Designs and note that they are positive. The Kuranakh Project is compliant with the State legislation and norms, is in possession of relevant Licences, permits and approvals and is in the process of obtaining the pending ones.*
>
> *Furthermore, WAI finds that the documents reviewed cover all aspects of the operations that require immediate attention at this stage and believes that IRC has demonstrated a great effort towards ensuring compliance with the Russian Federation requirements and laws and in seeking to achieve parity with international good practices at the Kuranakh Project . WAI is encouraged by this responsible attitude and would recommend that such an approach be maintained during the life of the operations at the Kuranakh Project.*

2.10.2.2 Environmental Status

WAI understands that the Kuranakh Project area is not designated for particular biodiversity/ cultural interest or protection. However, a nature protection area, the Imangra botanic reserve, is in the proximity of the operations and therefore requires environmentally sound regimes of conduct of the operational activities.

Baseline studies have been undertaken in order to determine the environmental status within and outside the boundaries of the licence territory. These studies shall be maintained throughout the project life in the form of the environmental monitoring and shall aim to establish any pollution caused by the operations and the appropriate mitigation measures.

> ***WAI Comment:*** *WAI understands that the baseline studies undertaken as of May 2010 duly characterise the current environmental status at the Kuranakh Project. Furthermore, potential impacts of the operations are currently assessed and it is IRC's intention to ensure that the environmental quality does not deteriorate and the environmental media is afforded a required level of care.*

2.10.2.3 Management Plans, Procedures and Polices

The Kuranakh Project is being developed in accordance with IRC's corporate policies. The operational activities at the Kuranakh Project are guided by the Corporate Health and Safety Policy which employs a systematic management approach and is aimed at achieving continuous improvement. Additionally, the emergency reaction and closure plans have been prepared for the individual facilities located at the Kuranakh Project.

The World Bank Group ("WB") has developed guidelines with respect to environment, health and safety ("EHS") which provide examples of Good International Industry Practice ("GIIP"). In 2007 an extensive review of the guidelines occurred updating the previous standards. The International Finance Corporation ("IFC") through WB has produced EHS guidelines for industry sectors, which includes open pit mining and milling (December 2007) and have also been developed for a range of indicators such as air quality and noise.

The IFC applies environmental and social standards to all the projects it finances, to minimize their impact on the environment and on affected communities. These standards clearly define the roles and responsibilities that are expected of the IFC and its client companies and represent the widely accepted standards of best practice for extractive industry operators who may be seeking international finance. The Performance Standards cover:

- Indigenous People;
- Cultural Heritage;
- Land Acquisition and Involuntary Resettlement;
- Labour and Working Conditions;
- Community Health, Safety and Security;
- Pollution Prevention and Abatement;
- Social and Environmental Assessment and Management Systems; and
- Biodiversity Conservation and Sustainable Resource Management.

The Equator Principles are a 'benchmark for the financial industry to manage social and environmental issues in project financing'. The Equator Principles Financial Institutions (EPFIs) have adopted these Principles in order to ensure that the projects they finance are developed in a manner that is socially responsible and reflect sound environmental management practices. By doing so, negative impacts on project-affected ecosystems and communities should be avoided where possible and if these impacts are unavoidable, they should be reduced, mitigated and/or compensated for appropriately. EPFIs will not provide loans to projects where the borrower cannot demonstrate adherence to the ten principles listed below:

- Principle 1: Review and Categorisation
- Principle 2: Social and Environmental Assessment
- Principle 3: Applicable Social and Environmental Standards
- Principle 4: Action Plan and Management System
- Principle 5: Consultation and Disclosure
- Principle 6: Grievance Mechanism
- Principle 7: Independent Review
- Principle 8: Covenants
- Principle 9: Independent Monitoring and Reporting
- Principle 10: EPFI Reporting

Since the Kuranakh Project seeks to achieve and maintain recognised standards of good practice, a series of management plans, policies and tools have been introduced at corporate and project level to comply with WB EHS Guidelines, IFC Performance Standards and the Equator Principles.

IRC has prepared a Community Engagement Plan for the Kuranakh Project. The plan provides an analysis of and describes the stakeholders and the communities affected by the Kuranakh Project and was sent to the IFC for review at the end of 2009. Furthermore, a grievance mechanism has been prepared and introduced in the areas of residence of the affected communities (both the indigenous people and the local communities), as follows:

- Olekma village (local communities) since 2008; and
- Ust-Nyukzha settlement (populated by the indigenous people, the Evenks) since 2009.

Overall, the grievance mechanism stipulates for collection, registration and management of complaints and suggestions from the stakeholders. To this end, a few claims have been registered and addressed from the Olekma village, however, none have arrived from the indigenous peoples at Ust-Nyukzha. Moreover, impact assessments on the indigenous people of the Ust-Nyukzha settlement together with the Indigenous People Development Plan are at the drafting stage. The latter shall be agreed with both the Heads of the indigenous people's communities and the Head of the North Amur Region's indigenous people's association. The agreed plan shall be subsequently provided to the IFC for review.

IRC intends to prepare an Environmental and Social Management Plan for the Kuranakh Mine in accordance with the IFC requirements and guidelines by the end of 2010.

Currently, the environmental aspects at the Kuranakh Project are managed according to the Environmental Management Plan set out in the Environmental & Social Impact Assessment for the Kuranakh Project (2006). Additionally, an Environmental Protection Action Plan is prepared on an annual basis which outlines the responsibilities of the management and the workers including aspects pertaining to protection of air, soil, surface waters, forestry and vegetation, flora and fauna. Measures aimed at minimisation of risks and pollution control are also outlined and supplemented by management procedures.

> ***WAI Comment:*** *It is WAI's opinion that IRC's actions towards satisfying both the national standards and requirements and achieving the international best practise are successful at both the project and the corporate level.*

The existing Health and Safety ("H&S") Policy and Procedures are sound and well-conducted. These policies cover training of the personnel, attestation of workplaces and insurance policies.

WAI has reviewed the accidents records for 2009 and considers that although Kuranakh has relatively low accident rates with no fatalities registered, the occupational health and safety issues should be given a higher priority and increasingly diligent measures are introduced to promote safe and healthy working conditions and to protect workers' health.

Moreover, WAI would recommend that an appropriate, formalised human resources policy should be prepared to include statements of the Group's corporate policy on such matters as the workers' entitlements, H&S and hygiene, emergency preparedness and related issues.

WAI endorses the Environmental Protection Action Plan which has been made available for review which appears to cover all projected aspects of the operations. Furthermore, the plan is supported by an adequate budget stipulated to enable execution of the environmental protection measures.

Furthermore, WAI considers the intention to introduce an international standard for environmental and social management to be a positive and proactive step towards enabling environmental compliance and this should form the basis for ensuring environmental improvement over time.

WAI considers that an Environmental and Social Management System should be implemented and that it would be an advantage if this were to achieve ISO 14000 accreditation. WAI further considers that support will be necessary from qualified professionals in order to meet this aim.

2.10.2.4 Closure and Rehabilitation

A Mine Closure and Rehabilitation Plan is included in the mining and processing design for rehabilitation of disturbed land (Volume 1 "Earthworks", Volume 2 "Construction works") documents. These design documents are reported to have been formally agreed with the relevant landowners (however WAI has been unable to verify this):

- Administration of the Tynda Region of the Amur Region;
- Tynda Forestry; and
- Forestry Management Authority for the Amur Region.

Financial costs required for liquidation of the mine, the processing plant, the Tailings Management Facility ("TMF") and other facilities have been identified and calculated as part of the abovementioned design documents, both of which provide a full scope of rehabilitation, including the removal of facilities as well as post-closure care.

Thus far, the total financial provisions accumulated for the purposes of closure of the facilities as well as rehabilitation of disturbed areas within the Kuranakh Licence add up to US$2.9M.

It should be noted that this figure is subject to revision to reflect the actual costs required at the time of closure and rehabilitation. The strategy for accumulation is reported to have been adjusted within the current year.

> ***WAI Comment:*** *It is WAI's opinion that the existing Mine Closure and Rehabilitation Plan integrates a number of concepts on a site wide basis, is comprehensive and adequate. WAI believes that although the Mine Closure and Rehabilitation Plan is based on the application of international best practice and is not strictly limited to satisfying Russian requirements, it still should be extended to incorporate social aspects and the post-mine use of the infrastructure. Here, future public health and safety should not be compromised and the after-use of the site should be beneficial and sustainable to the affected communities.*

The incremental scheduling of payments for rehabilitation throughout the mine life is a sound approach and can reduce the overall closure liability at any time. Using the incremental method closure costs shall be accrued by gradually increasing the provision over the life of the mine. The future costs of restoration of individual pits and waste dumps can be accrued such that closure costs are allocated equitably to the periods of operation.

2.10.2.5 Water Management

The project area is located in the interfluvial plan of the Kuranakh and Saikta Rivers. The nearest watercourse to the Kuranakh Deposit is Yuzhny-1 Creek whilst the closest one to the Saikta Deposit is the Yuzhny-2 Creek, at distances of 700m and 500m respectively. As a result, water protection zones have been established.

Water protection zones or sanitary protection zones are established to provide a stand-off distance or buffer from a surface feature which requires environmental protection measures to be taken. Distances within which encroachment of development is restricted or prohibited are set according to standards set by the Russian Authorities.

Control and prevention of 'Disaster situations' are expected to be included within the 'Emergency Protection Plan' (see section 2.10.2.7).

The existing hydrological network is expected to undergo negative impact during the Kuranakh Project's construction and exploitation stage, mainly due to the migration of suspended solids. Pumped minewater and surface run-off will require treatment to reduce suspended solids and hydrocarbon contamination, with the water being reused to minimise the pressure on water resource use and to reduce contamination. There is no discharge from the process plant, which is operated in closed circuit.

However, it is understood that the project design makes provision for construction of settling lagoons if required, although details are not included within the WAI review of the KSG Feasibility Study (2008). However, the EIA notes that there is a risk that the treatment facility as proposed will not be sufficiently robust to ensure compliance with current World Bank discharge standards.

The domestic sewage water treatment plant (Biodisk-100) was completed and became operational in H2, 2009 at the Kuranakh Project. Treated water will be used for dust suppression or other technical purposes.

> ***WAI Comment:*** *From the documents provided for review, WAI has not identified any significant risks related to water quality and use, however, WAI would emphasise that management of the water use and quality, both in and around the mining Licence, can become a significant issue, particularly in the TMF area.*
>
> *WAI understands that with the proximity of the watercourses to the production facilities, the need for effective control of water management has been identified as the key issue. Here, the protection of water resources and water quality is and will be paramount, requiring effective water management practices.*
>
> *The construction of an engineered surface tailings disposal facility is designed to comply with the State requirements. Leakage management and stability analysis are key considerations in the design, construction, operation and closure phases of the TMF. WAI note that the area is considered to be seismically active (amplitude 7 on the Richter scale).*
>
> *The last earthquake in the region occurred in 1989. The Kuranakh Deposit site is located within the Olekma seismic zone. Regionally, the deposit site is connected with Baikal seismic zone, reaching in a latitudinal direction for more than 1500km. As is typical for earthquakes with an epicentre in the Amur region, the depth of the earthquake sources within the Olekma seismic zone is generally 5 – 10 km below ground level, and seldom 15 – 30 km below ground level. This seismic characteristic corresponds to the seismic zoning scheme prepared by the Institute of the Earth's Crust in the town of Irkutsk, for the Baikal-Amur Railroad. The Olekma seismic zone is characterized by sizeable earthquakes. The following earthquakes took place here:*
>
> - *Nyukzhinskoye (1958) and Olekminskoye (1958) earthquakes with a magnitude of 6.4 on the Richter scale;*
> - *Tass-Yuryakskoye (1967) with a magnitude of 6.4 on the Richter scale;*

- *South-Yakutskoye (1989) with a magnitude of 6.6 on the Richter scale.*

Due cognisance will be required as to the water management aspects and as such adequate waste management techniques, particularly in respect to tailings, should be adopted.

2.10.2.6 Environmental Quality Monitoring

An environmental monitoring programme has been prepared to meet legislative and licence requirements. The Centre for the Laboratory Analysis and Technical Measurements for the Amur Region (TSLATI) has been commissioned to carry out a set of environmental quality studies. These include assessments of air quality, soil, surface waters and bed silt of the Saikta River and the Yuzhny-1 Creek, taking samples apropos the monitoring schedule, assaying in the accredited subcontractor laboratories, results analysed and the forecasts made for the future changes in the environmental media. The derived data are subsequently reported to the state authorities and corporate management.

WAI Comment: *WAI has reviewed the monitoring report for 2009 and understands that the impact on the environment at the construction stage is assessed as acceptable and localised. No areas of inherent concern have been identified.*

The determinants monitored in the water environment have generally not exceeded the established thresholds. The exceptions are those elements which are naturally high within the existing environment (iron, manganese, ammonia and organics), due to acidic soils with low permeability, presence of permafrost and un-decomposed organic acids. Soil samples have been taken regularly in accordance with the monitoring plan. All determinants tested are reported to be within the established thresholds.

WAI considers that the air quality monitoring is adequate at this stage of the project development, and the monitoring reports do not reveal any significant impacts on the existing air quality in the licence area. WAI would advise that air monitoring programme should include Particulate Matter (PM10 and PM2.5) and greenhouse gas emission and control measures.

WAI also recommends that the existing monitoring programme should include snow sampling, to provide complete and representative data.

On the whole, the monitoring programme as drafted by IRC is a primary tool in measuring the environmental impacts and enables IRC to adjust the monitoring practices over time. WAI considers that the programme requires minor modifications and improvements pertaining to the air quality and snow monitoring.

2.10.2.7 Waste Management

Management of both domestic and production waste at the Kuranakh Project receives due cognisance and adequate arrangements are in place for waste handling. Waste rock is the main type of waste generated by the open pit mining operations at the Kuranakh Project and is stockpiled in the constructed waste dumps to be further utilised during the construction of the tailings dam and haulage roads. Furthermore, the classes of hazard have been determined. Disposal limits and norms have been assessed and management procedures drafted.

Tailings management techniques have been identified as the area requiring significant effort in studies, designs and approvals. The Tailing Management Facility design forms an integral part of the Processing Design which has received the following approvals:

- Approval of the State Expertise granted by Rosprirodnadzor of the Amur Region;
- Certificate of the State registration of the hydro-technical facility with the Department of the Russian Registrar for the hydraulic engineering, supported by a letter from the Administration for the State energy control of the Federal Service for the environmental, technological and atomic control "on approving of the Safety Declaration for the TMF structure";
- Letter from the Federal Service for the environmental, technological and atomic control of the Ministry of Natural Resources and Environment of the Russian Federation "regarding the Safety Declaration for the TMF";
- Approval by the Head of the State Expertise of the Ministry of Emergency Situations;
- Safety Declaration (Emergency Procedures) for the TMF; and
- The Conclusion of experts for the Section on Engineering and technical actions of the civil defence.

WAI Comment: *WAI understands that the TMF is designed such that the permafrost layer will rise with the filling of the tailings lagoon and that whilst the base of the TMF is not lined, the dam walls will be provided with an impermeable liner. This is intended to create an isolated system with piezometers fitted with temperature sondes and drainage wells at the base of the dam walls. The design of the TMF has been undertaken by PHME specialists experienced in permafrost conditions. Nevertheless a strict monitoring regime will need to be established to ensure long term stability and security of the structure.*

Furthermore, it is understood by WAI that the second/third year of exploitation of the TMF will require discharge of the streams from the water-collecting area of the structure. In this connection, an adequate arrangement will be required to implement this and to date, a rock-fill drain has been suggested. However, to WAI's knowledge, no definitive design to cover this aspect has yet been drafted.

WAI considers that the tailings management in general is a sensitive subject in the region and therefore the TMF management should be a key consideration in design and operation of the tailings facility structure on a long-term basis. Water protection is considered a high priority and requires significant effort and adoption of best practices for that reason.

WAI is encouraged to find IRC's strategy and the attitude toward the management techniques for both the domestic and industrial waste to be responsible and would recommend that a detailed Tailings Management Plan should be drafted to support this. Such a plan would cover all necessary management aspects, including stability, emergency prevention and response procedures on the long-term basis.

2.10.2.8 Social Issues

The Amur Region has a population of indigenous Evenk people who are traditional reindeer farmers and hunters. The nearest Evenk settlement is approximately 70km from the Kuranakh Project site, although the site is within the limits of their grazing and hunting grounds. With the exception of the Imangra botanic reserve, no cultural, archaeological or historical heritage around the project area exists, nor are there areas of geological or special scientific interest present.

Preceding the OVOS submission process, a social baseline study was undertaken. Results and the statistics have been presented and reviewed by WAI. Public consultations have been conducted in accordance with the OVOS process as well as to satisfy the IFC's requirements in the following manner:

- Preliminary public consultations regarding the environmental impact assessments, held on 09 April 2006 at the Olekma village;
- Public consultations pertaining to the Mine Design and the Processing Design, held on 19 March 2009 at the Ust-Nyukzha settlement (indigenous people); and
- Public consultations to discuss the location for the proposed domestic and production wastes, held on 21 September 2009.

Furthermore, IRC carries out regular meetings and consultations with the indigenous people and affected communities and is rewarded by the positive response received. At Ust-Nyukzha, a grievance mechanism has been recently implemented as outlined above. An assessment of impacts on the indigenous Evenk people has been prepared. IRC has also drafted a Community Development Plan to support the indigenous Evenk people of the locality, for which internal approvals are currently being sought.

It is IRC's policy to support cultural events at neighbouring communities. Community undertakings for 2008 – 2009 amounted to RUR$1.3M.

> ***WAI Comment:*** *WAI considers that with the commissioning of the Kuranakh Project as a major employer in the vicinity, the local economy would receive a significant boost. It is WAI's opinion that the Kuranakh Project has demonstrated a responsible approach towards engagement of the stakeholders and management of socioeconomics.*
>
> *WAI also considers that an introduction of the formal grievance mechanism at Ust-Nyukzha is a responsible act and allows the indigenous Evenk people an opportunity to express any future concerns about the operations thus enabling IRC's management to understand the community's perceptions of the project risks and to adjust its measures and actions to address issues raised.*
>
> *WAI believes that the communities' potential concerns associated with mining activities, transport and handling of hazardous goods as well as impacts to water quality and quantity should be minimised through adopting modern techniques and international best practices. In this connection, WAI advises that the introduction, implementation and maintenance of ESMMP (Environmental and Social Management*

Monitoring Plan) would be required to ensure continued compliance with the international best practices, such as the Equator Principles and IFC Performance Standards.

2.10.2.9 H&S Issues

The project is aiming to maintain high standards of occupational and community health and safety. Maintenance of a healthy and safe working environment together with the welfare of both Olekminsky Rudnik's employees and the communities that are local to their projects is a key priority for IRC.

The IFC appraisal team are reported to have met with representatives of the Olekma city council including the Mayor, the Head of the Regional Administration at Tynda, local health workers, and observed a public consultation meeting in Olekma. Formal meetings with the Amur Administration in charge of Mining and Environment took place in Blagoveshchensk and informal discussions with key stakeholders at Olekma.

WAI Comment: *WAI has reviewed the integrated Plan for the Health Protection and Industrial Safety which has been developed by IRC for 2010 and considers that it addresses the key areas pertaining to protection of workers health through implementation of organization, management, control and reporting both at the corporate and project level. The aims, goals and actions necessary to achieve a good performance and to satisfy the legislative requirements are set out with the budget stipulated to execute those.*

The Emergency Preparedness Procedures which have been reviewed by WAI are available for the main facilities such as the Saikta Deposit, explosives magazine, TMF and others. These have been reviewed by WAI and are deemed sound and concise.

WAI has reviewed the accident records and considers that apart from a few minor accidents, the injury rates have been kept low over the period reviewed, however, this issue requires addressing and continuous improvement. Overall, it is WAI's opinion that the Kuranakh Project is generally compliant with the state H&S requirements. WAI considers that more effort and time is required to achieve the international best practise.

WAI would also advise that a formal grievance mechanism through which the workers may express concerns is formalised and implemented at the Kuranakh Project. This would ensure that matters brought to management's attention are addressed expeditiously and feedback is provided in confidence.

2.11 Conclusions

In general, WAI considers that the Kuranakh Project is robust, with all appropriate infrastructure and facilities in place to achieve the planned mining schedule and production rates.

In terms of resources, the Kuranakh Deposit has been classified and approved by GKZ using the Russian System. Details of the Russian System data have previously been published by the IRC Group. The Saikta Deposit resources were estimated by WAI in 2008 and are calculated in accordance with the guidelines of the JORC Code (2004).

WAI has a high level of confidence in the data as described in this report, and considers that appropriate technical and economic parameters were used by IRC when estimating the resources, reserves and mining schedules. WAI considers that the capital and operating costs are appropriate and achievable.

3 KIMKAN & SUTARA (K&S)

3.1 Property Description and Location

3.1.1 Overview

K&S are large magnetite iron ore deposits. IRC is presently at the feasibility study stage of development, with trial mining operations planned to commence in 2010, ahead of full production in 2013. The pre-feasibility and Feasibility Studies carried out by IRC highlighted that the project benefits from excellent access to the existing transport infrastructure in Russia, and may therefore realise significant potential cost advantage versus its global peers. The development of the K&S project is dependent on obtaining appropriate funding, a process which is ongoing.

The two deposits host a large reserve and resource base and it is reasonable to suggest that the mine at the site will be operational in 2010.

The Kimkan and Sutara iron ore deposits are at an early stage of development with trial mining taking place at Kimkan Central. A large resource of iron ore has been identified and preliminary mine design and optimisation completed. Conventional open pit mining is planned, utilising three open pits: Kimkan West; Kimkan Central; and Sutara.

The Kimkan and Sutara iron ore deposits are located in the EAO Region approximately 40km from the Russian border with the PRC (see Figure 3.1). The Kimkan Deposit is located approximately 15km north-northeast of the Sutara Deposit, and consists of four sectors (Central, West, Mayskiy and Sovhozniy). Mining is currently planned for Central and West Kimkan only, as these deposits contain larger reserves and are better understood. At the end of the Kimkan Deposit mine life, the Sutara Deposit can be mined. The processing plant will be fed by Sutara ore via a conveyor belt after the Kimkan pits are exhausted.

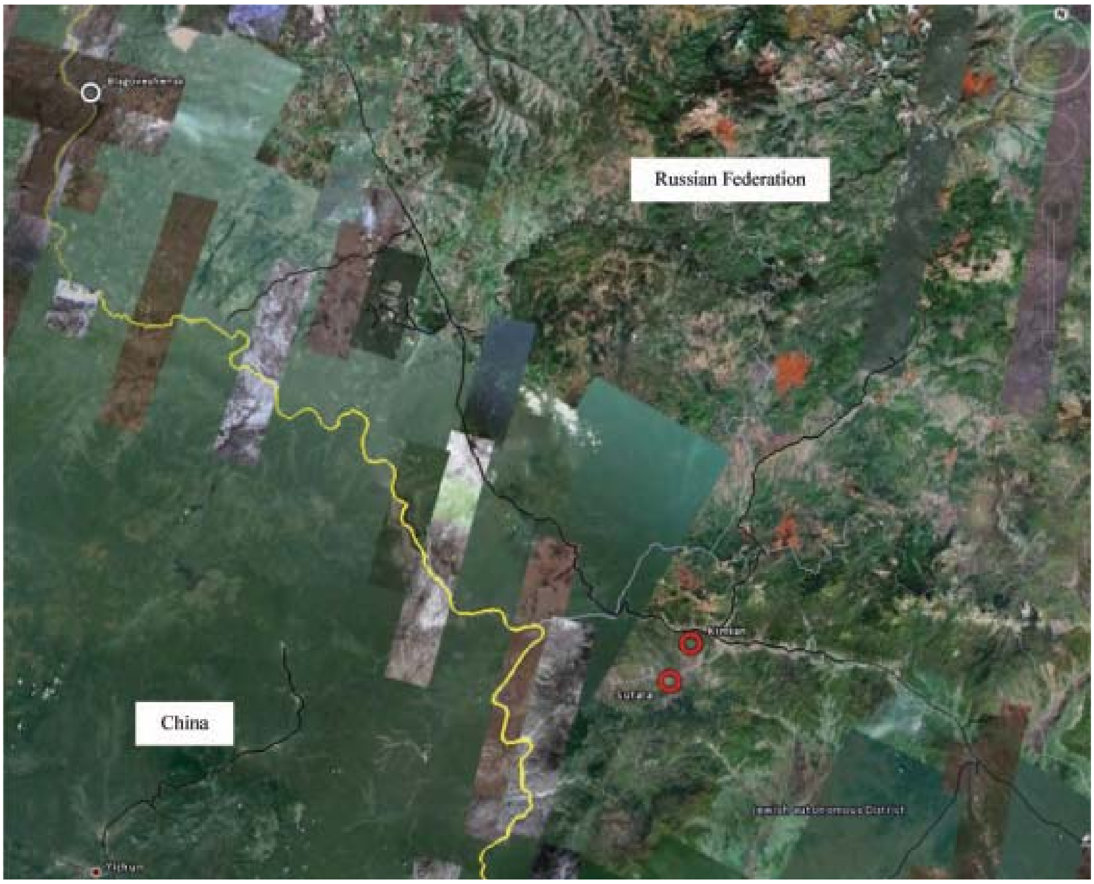

Figure 3.1: Kimkan and Sutara Location

3.1.2 Mineral Rights and Permitting

The Kimkan licence and Sutara licence are owned by KS GOK, a 100 per cent. subsidiary of IRC.

3.1.2.1 The Kimkan Licence

The Kimkan licence covers an area of 22.4km^2, and requires that the design is completed and approved, and construction be commenced by 30 December 2013, with production to commence no later than 30 December 2014 and target capacity (as approved in the design) to be reached by 30 December 2015. WAI believes that these requirements are achievable and that KS GOK is able to fulfil the licence requirement.

The Kimkan licence runs to 30 December 2025 and may be extended, with the consent of the licensing authority, until the deposit is fully depleted. The Kimkan licence does not require any further exploration under the licence terms. Completion of the definitive feasibility and design phases are expected to take approximately two years, and the physical development of the Kimkan deposit is expected to take a further two years, with full production commencing in 2013 and a target production of approximately 3.2Mt per year of magnetite concentrate.

3.1.2.2 The Sutara Licence

The Sutara licence covers an area of 27km^2, with a requirement for production at Sutara to commence by 30 December 2013, with a minimum annual extraction rate of 5Mt of ore to be achieved by 30 December 2014.

The Sutara licence runs to 30 December 2025 and may be extended, with the consent of the licensing authority, until the deposit is fully depleted. Exploration of the Sutara licence area is expected to take approximately 1½ – 2 years, and the Sutara Deposit could come into production at the end of 2013, in accordance with the provisions of the licence.

> ***WAI Comment:*** *WAI has inspected the licences for Kimkan and Sutara and believes that the boundaries as indicated on Figure 3.2 below are correct and in good order. However it should be noted that full-scale mining is not planned to begin at Sutara in line with the conditions of the licence (the mining schedule demonstrates production at Sutara beginning in 2023) and that it should be ensured that the conditions of the licence may be amended to reflect this issue (i.e. the licence may have to be extended). IRC is aware of this potential issue.*

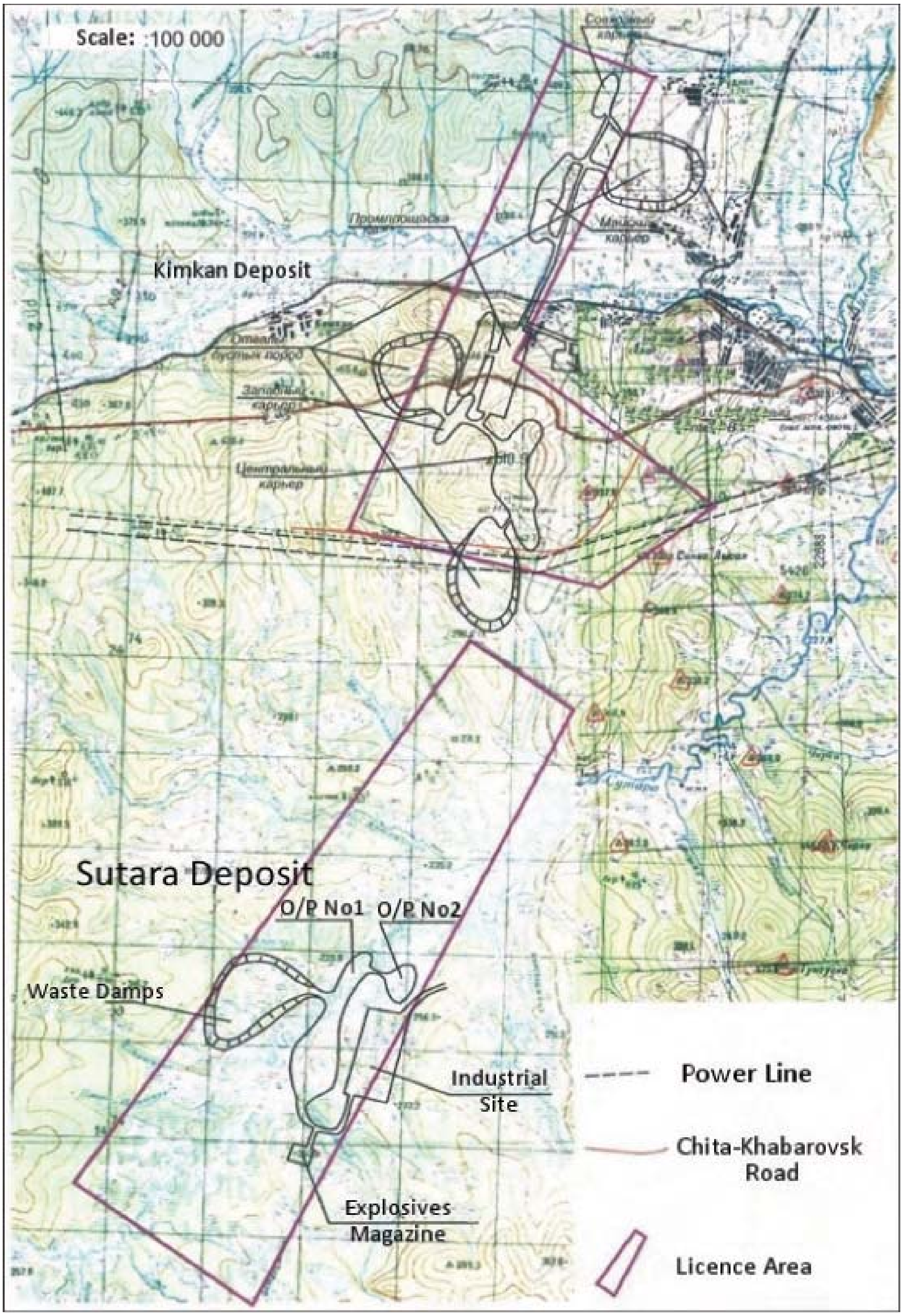

Figure 3.2: Licence Boundaries (Grid lines at 1km spacing)

Source: Provided to WAI during the February 2010 site visit

3.2 Accessibility, Climate, Local Resources, Infrastructure and Physiography

The Kimkan Deposit and Sutara Deposit are located at a distance of 4km to the west and 17km to the south respectively from the Izvestkovaya railroad station on the Trans-Siberian Railway in the north of the EAO Region. This proximity to the Trans-Siberian Railway provides significant logistical advantages, which enhances the commercial attractiveness of the site. The Sutara Deposit is situated at a distance of approximately 10km south of the Kimkan Deposit.

Energy will be supplied by a power transmission line, which is situated near the planned mine at Kimkan.

The Deposits are located in mountainous taiga terrain with sloping upland and wide marshy valleys. The rolling hills in the Kimkan area reach a height of approximately 800m (250m higher than the deposit itself). For the most part, Sutara is situated in the valley floor with a surface elevation of about 250m.

The climate in the EAO Region is monsoonal/anti-cyclonic, with warm, wet, humid summers due to the influence of the East Asian monsoon; and very harsh, cold, dry, windy conditions prevailing in the winter months courtesy of the vast Siberian high-pressure system.

The EAO Region benefits from easy access to the PRC market, which has demonstrated high growth in recent years. The EAO Region has an area of 36,000km^2 (about the size of Belgium) and a population of 191,000 (2002). The administrative centre is Birobidzhan. The economy is based on mining (gold, tin, iron ore and graphite), lumber, limited agriculture and light manufacturing (mainly textiles and food processing).

3.3 Geological Setting, Deposit Types and Mineralisation

3.3.1 Introduction

The two iron ore deposits of Kimkan and Sutara are situated within the South Malo-Khingansky metallogenic belt of the EAO Region of the Khabarovsk Territory.

The Khingansky iron-ore field is located within a geosyncline associated with Bureinskom massive, and is associated with metamorphosed (greenschist to amphibolite facies) volcanogenic-sedimentary units of Late Proterozoic — Early Paleozoic (early Cambrian) age. The ore-bearing formations consist of dolomites, phyllite-schists, and ferruginous quartzites. The ore-bearing formations are contained within an N-S striking field which has a total length of 150km and with a width of 10-40km. This late Proterozoic-early Cambrian sequence is intruded by granitoids with K-Ar ages of 604 and 301Ma.

The Khingansky metallogenic belt is interpreted as forming in a volcanic and sedimentary basin along an unstable proto-continental margin, or in a fragment of Archean craton that was incorporated into an accretionary wedge terrain.

The Khingansky formations have been folded into the steep linear folds with a N-S orientated fold axis, which have been further complicated by smaller secondary folding and complication of the limbs. Accordingly, the ore bodies are steeply dipping (75-80°) and hosted within tremolite dolomites, tremolite-carbonate and quartz-micaceous schists. These N-S striking ore bodies are often further dislocated by E-W trending fault zones.

It is understood that at least 17 deposits have been identified in the Malo-Khingansky iron-ore field, of which the Kimkan, Sutara, Kosten'ga and Yuzhno-Khinganskoye deposits have been the most extensively studied.

IRC have considered two main ore deposits within the Malo-Khingansky field which consist of:

- Kimkan — the Central and West zones only; and
- Sutara — the Southern Zone only (Ore Bodies 1, 2 and 3).

A brief geological description of the two main ore deposits is given below.

3.3.2 Kimkan

The Kimkan Deposit is hosted within metamorphosed volcano-sedimentary and sedimentary rocks. These consist of the Iginchinskaoy Formation (which includes schists, aleurolites and sandstones), carbonate rocks of the Londokoskoy Formation (limestones) and igneous rocks (which include granites, diabase and quartz porphyry). The ore-bearing formations consist of schists, dolomites, ferrugeinous quartzites and carbonates of the Nadrudnogo horizon (limestones and dolomites).

The host rocks and ores are covered by loose quaternary deposits represented by loams with rock waste, various grit and sand-pebble material, 1-30m thick. In the flood plains the quaternary deposit thickness is over 100m.

The Kimkan Deposit is estimated to be 18km in length and is divided into four distinct ore zones, of which the most important is the Central (Tsentralniy) zone. The ore is in stratified zones with strike length varying from 500-3,800m with a thickness up to 60m and dips of 65 – 90°. The ore is mainly magnetite and haematite-magnetite with an average iron content of 35.7% Fe within those parts explored. The ore also contains manganese (0.5 – 1.5%), germanium, vanadium, titanium and gold.

The Deposit is divided into four separate ore zones — Central, Western, Maisky and Sovkhozny. The main ore zone is Central which accounts for more than half of the deposit reserves at Kimkan (See Figure 3.3 & Figure 3.4 & Figure 3.5 below). Both the Central and West ore zones have been tectonically divided into three parts by approximately E-W block faulting and consist of the Northern, Central and Southern blocks.

The ore bodies in the Central Zone (which strike in both an approximately NW-SE and NE-SW direction) consist of sheet-like ferruginous-quartzite structures (Proterozoic banded iron formations) varying from 2m to 60m in width, which have been intensely folded together with the host rocks into a major anticlinorium. Individual ore bodies dip both to the west, east and in a north-west direction, at angles of 60 – 85°, and sometimes vertically. The strike length of the ore at outcrop varies from 850m to 3,600m and from drilling is known to extend to a depth of 200m-400m.

The depth of oxidation within ore zones of the deposit varies from 10m to 210m and averages 30m to 60m.

A single main ore body defines the western zone which strikes in a NE-SW direction and dips steeply to the NW. Oblique strike slip faulting divides the ore body into three, namely the Northern, Central and South blocks (as shown in Figure 3.6 & Figure 3.7 below).

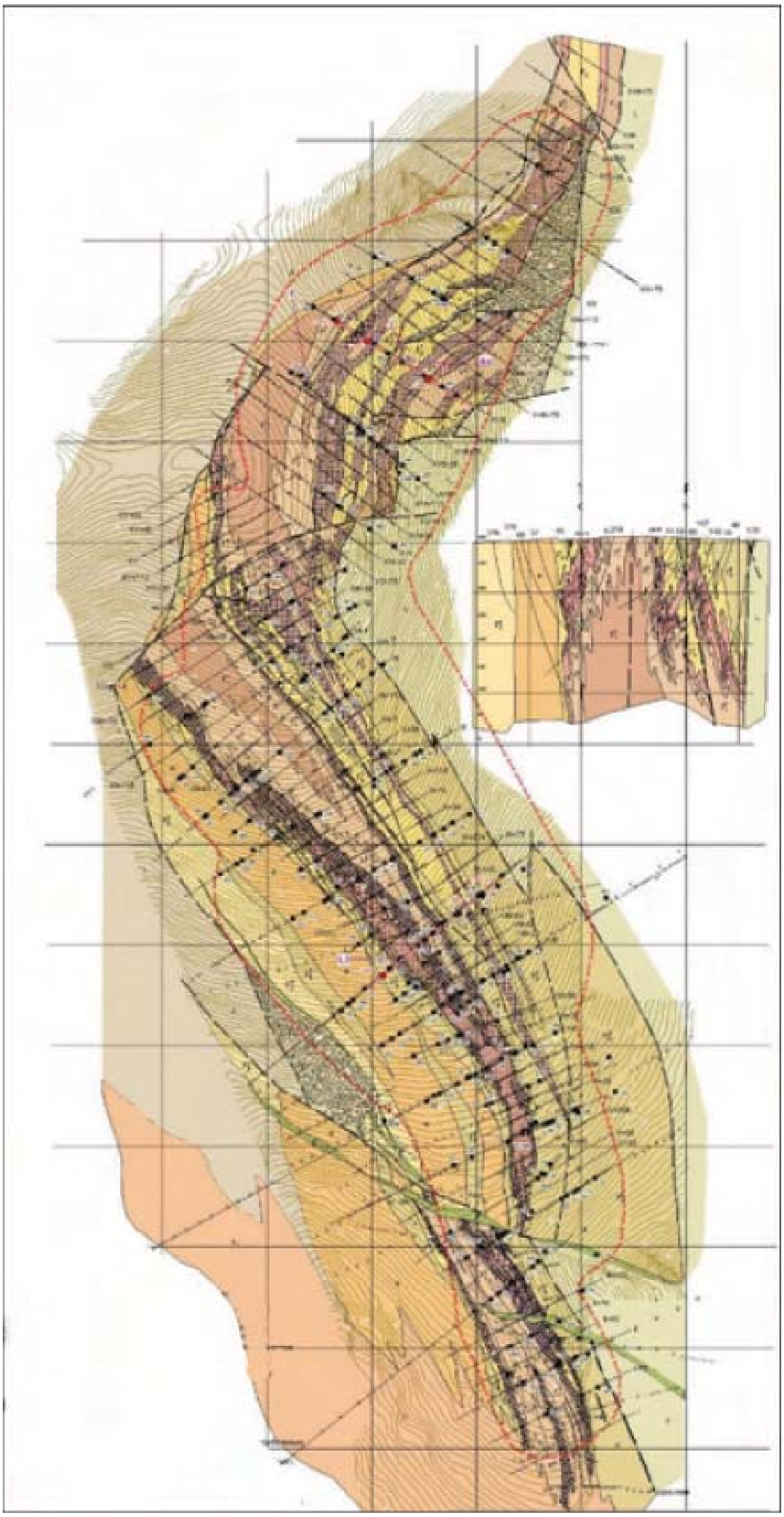

Figure 3.3: Geology of the Central Zone at Kimkan (Grid lines at 1km spacing)

Source: Provided to WAI by IRC during the February 2010 site visit

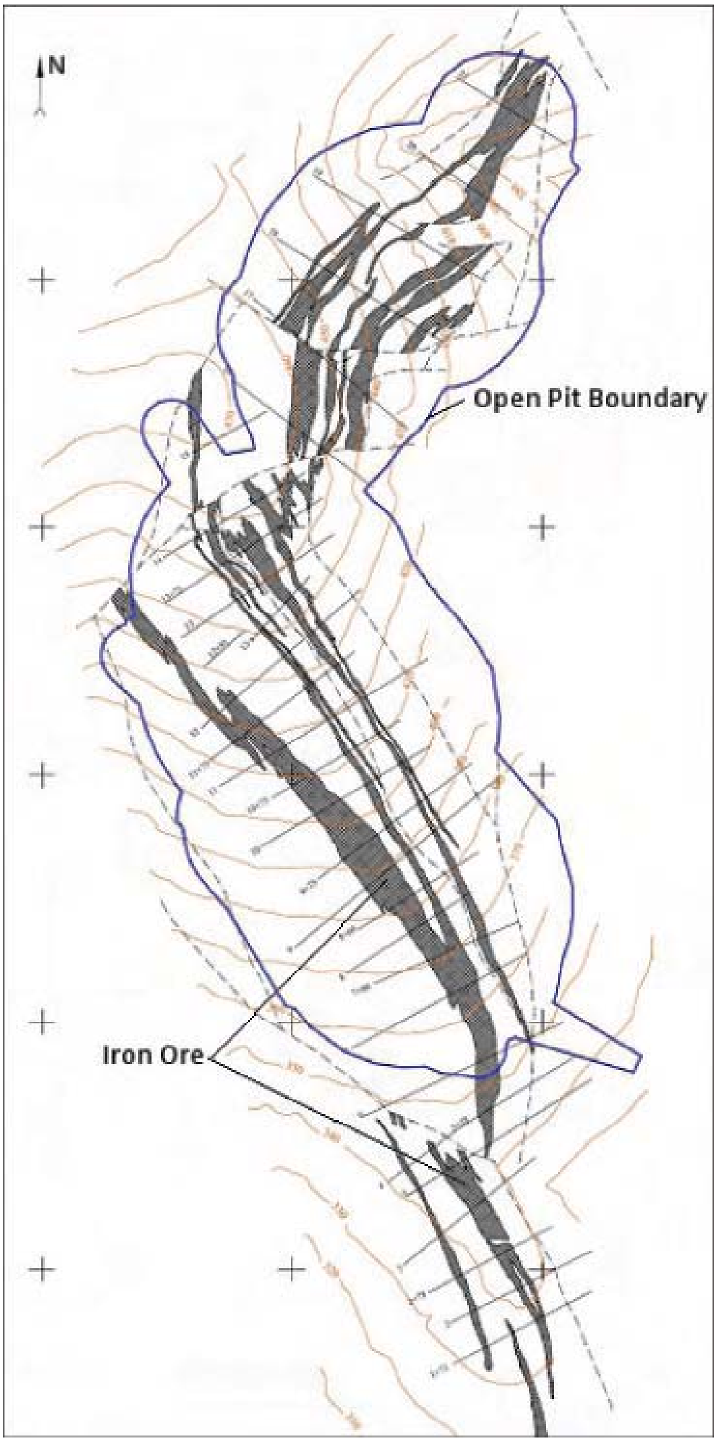

Figure 3.4: Simplified Geology of the Main Kimkan Ore Bodies within the Proposed Pit Outline in the Central Zone

Source: Provided to WAI by IRC during the February 2010 site visit

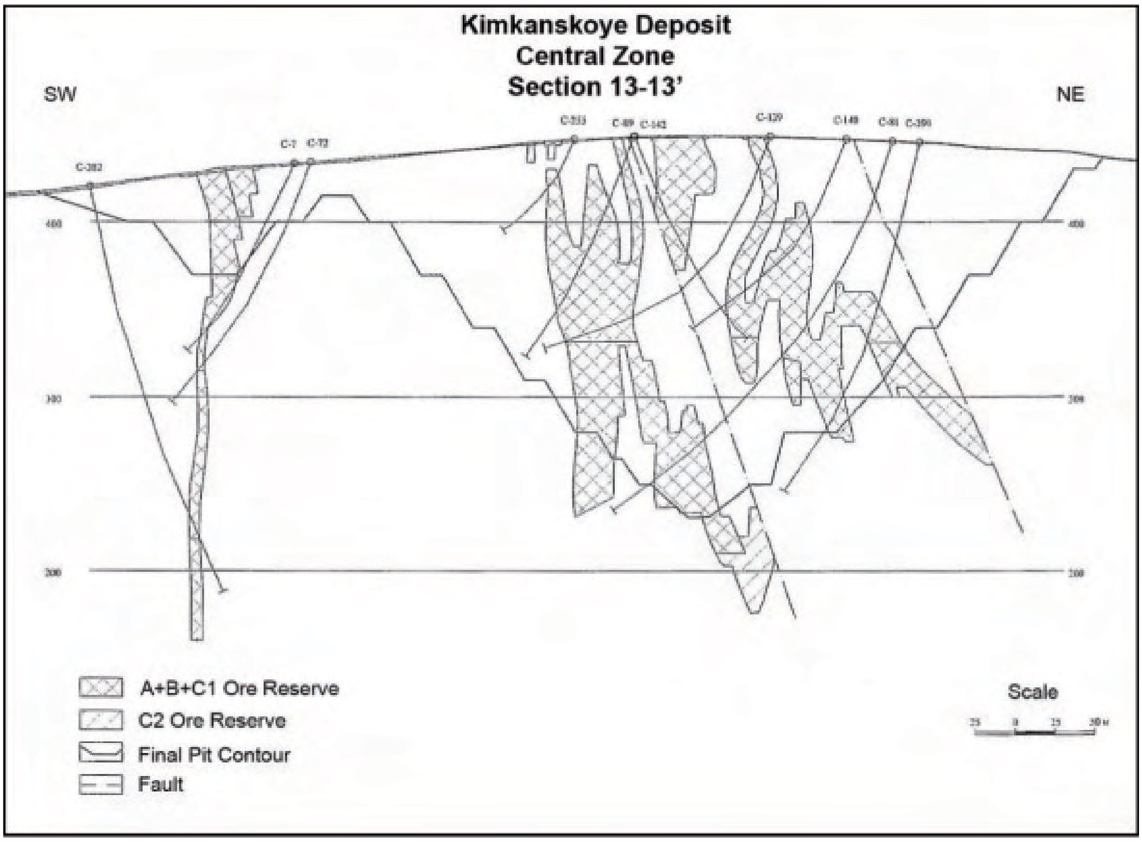

Figure 3.5: Generalised Cross Section through Central Zone at Kimkan (Showing an Idealised pit profile)

Source: Provided to WAI by IRC during the February 2010 site visit

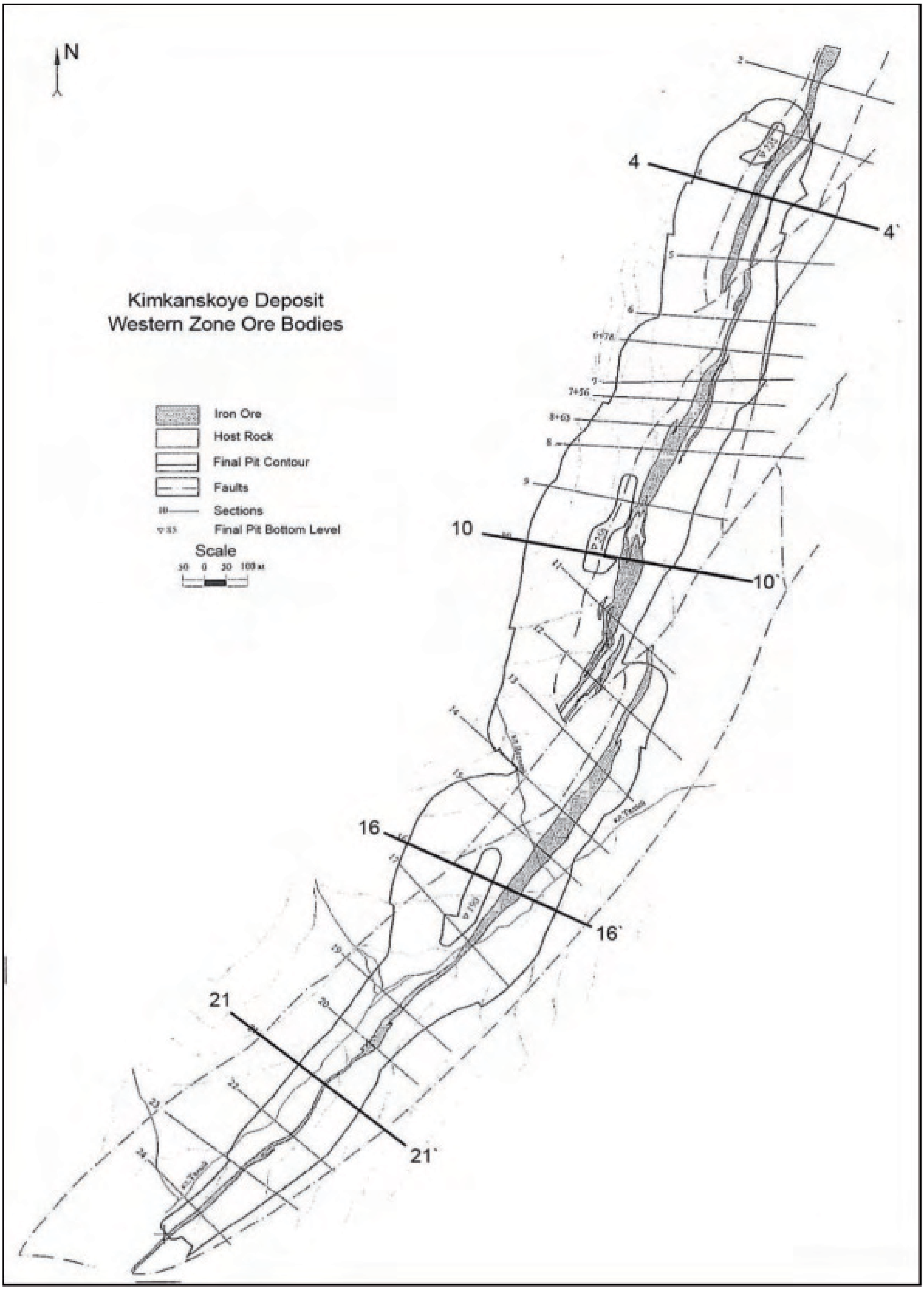

Figure 3.6: Geology of the Main Ore Body at Kimkan within an idealised Pit Outline in the Western Ore Zone

Source: Provided to WAI by IRC during the February 2010 site visit

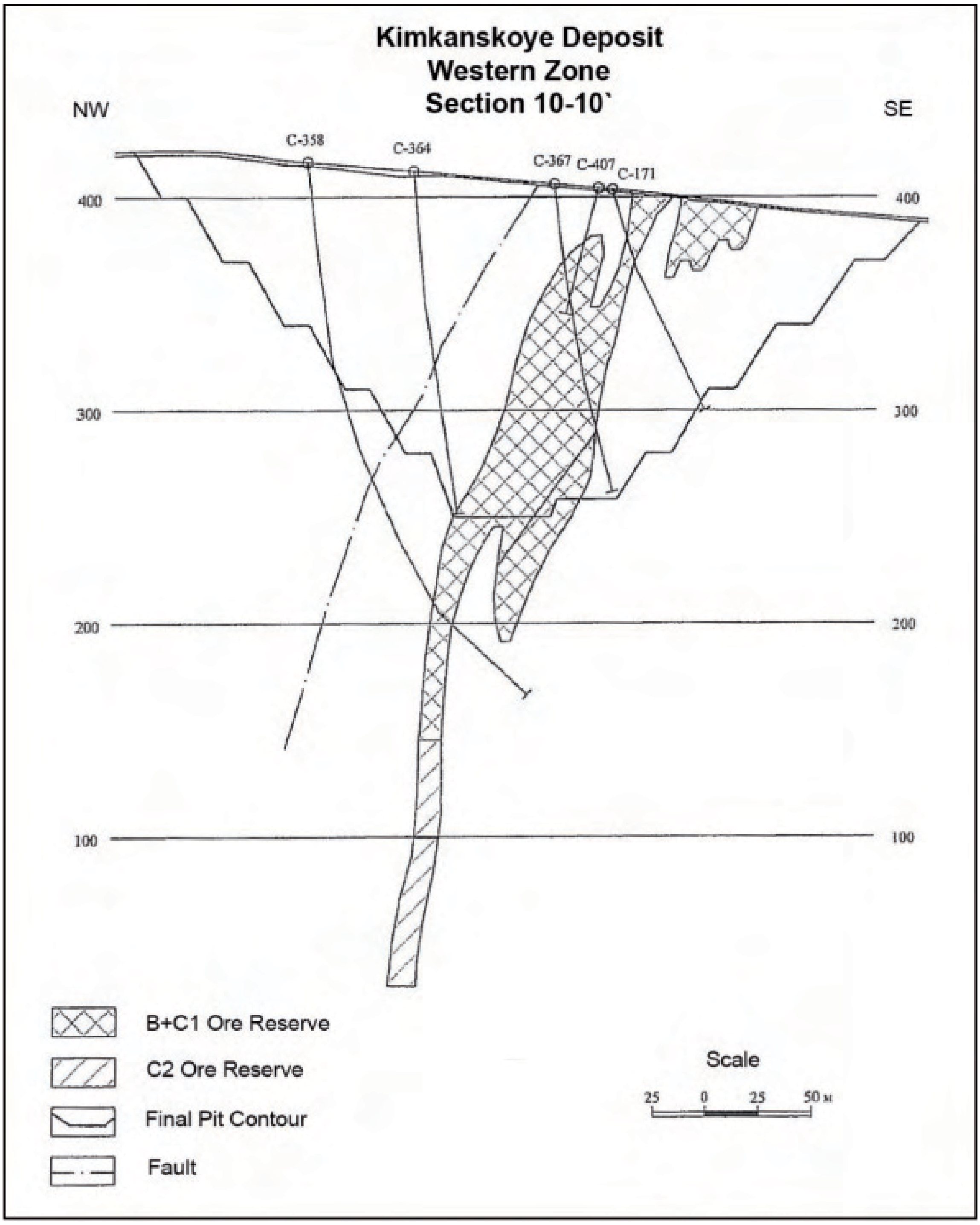

Figure 3.7: Generalised Cross Section through the Western Ore Zone at Kimkan (Showing an Idealised Open Pit Profile)

Source: Provided to WAI by IRC during the February 2010 site visit

The ore at Kimkan can be divided into three main types which include:

- Predominantly magnetite (approximately 63%);
- Haematite-magnetite (approximately 20%); and
- Oxidised martite and haematite-martite (approximately 17%).

The predominantly magnetite-quartzite ore generally gravitates to the margins and is found on both the hanging and footwall, where it forms layers. The haematite-magnetite quartzite is confined to the central/axial portion of the ore zone.

Magnetite and haematite are among the dominant ore minerals of the primary ore. Sulphides are rare and consist of disseminated pyrrhotite, pyrite and chalcopyrite. In addition to martite, ferrous hydroxide is also present in the oxidation zone.

The main non-metallic mineral is quartz; however amphibole, plagioclase, chlorite and apatite are also quite common. The ore texture is banded in places and often has the fine cross veinlets of quartz, amphibole, chlorite and carbonate.

The structure of the essentially magnetite ore ranges from the close-grained to fine-grained. The fine-grained structure prevails in the haematite-magnetite ore. Characteristic features of the ore include the intimate intergrowth of the ore and non-metallic minerals.

Typically the density of the ore is 3.4t/m^3 with the density of the host rocks being approximately 2.7t/m^3.

The phosphorus content in the ore ranges between 0.20 and 0.26% and averages 0.25% whilst the sulphur content varies between 0.18 – 0.26%, and averages 0.21%. The average chemical composition of the iron ore to be sent to the plant is given in Table 3.1 below.

Table 3.1: Average Chemical Composition of Kimkan Ore

Components	Average Content, %	
	Central Area	Western Area
Fe_2O_3	36.08	36.64
FeO	12.23	10.84
SiO_2	39.77	40.20
CaO	2.19	1.53
MgO	3.35	2.15
Al_2O_3	1.40	3.62
TiO_2	0.20	0.30
MnO	0.75	0.90
P_2O_5	0.57	0.56
S	0.29	0.18
K_2O	0.43	0.40
Na_2O	0.74	0.70
Impurity percentage	2.00	2.00

Note: the silica content of the ore is high (39-40%) however, this is within reasonable limits.

3.3.3 The Sutara Deposit

The Sutara Deposit was first discovered as a result of aeromagnetic surveys undertaken in 1952-1953 (1:100 – 1:200,000 scale) and ground-based magnetometer surveys (1:2,000 – 1:100,000 scale)

The Deposit can be traced for 14km in a north-easterly direction with a width of 2.0-2.5km. The deposit consists of three ore zones, with ore bodies striking in an approximately north-south direction with lengths of 800-3,600m and widths varying from 20-75m to 220-240m. The predominant mineral content is magnetite and silicate-magnetite with an average general iron content of 33% Fe.

This Deposit is again separated tectonically by east-west trending faulting, which truncates the deposit into three main blocks, the North, Central and South Zones. The main zone, which has had the most exploration activity on it, is the South (Yuzhni), zone, which lies on either side of the Sutara River and is approximately 6km in length. The overburden here is from 2m to 20m, but to the north reaches a depth of over 190m. This apparent thickening of the overburden overlying the Central block is thought to be the result of this block representing a downthrown fault graben.

In the South Zone, the main mineral reserves (as classified under the Russian System details of which have previously been published by the IRC Group) are located in three ore bodies numbered 1, 2 and 3 (as shown in Figure 3.8 below).

- Ore Body 1 — contains approximately 66% of the mineral reserves and can be traced over 3.7km, with widths of 2-20m. In the extreme south, this ore body has a strike of some 5-600m but has a width up to 240m;
- Ore Body 2 — contains some 5% of the mineral reserves and consists of two distinct layers with a strike length of 800m and widths of 5-15 and 24-40m wide which are separated by a barren interval some 20m wide; and
- Ore Body 3 — contains over 29% of the mineral reserves, but has the most complex morphology.

The Central Zone is contained within a fault graben with a strike length of 3.5km, which has filled with friable sediments of Neogene age to a depth of 50-270m depth. Two vertical zones have been identified in drillholes with widths of approximately 20-30m and 80m.

The Northern Zone has a strike length of 4km and several intensely folded magnetite-quartzite zones of 10-35m width have been outlined

The ore at Sutara can be divided into four main types:

- Essentially magnetite and silicate-magnetite ores (with an average content of total iron of 32.85% which make up over 75% of the mineral reserves);
- Magnetite-haematite (which makes up some 12% of the mineral reserves);
- Low-grade magnetite; and
- Oxidised martite and haematite-martite and hydrogoethite-martite. These are developed to a depth of 8-44m.

Figure 3.8: Simplified Geology of the South Zone at Sutara

The mineral composition, textures, structures of the ore and components present are similar to those of the Kimkan Deposit.

The distinguishing feature of the various types of ore at Sutara is their relatively high content of iron associated with haematite, ferruginous carbonates and ferruginous silicates. The deleterious components within the ore are phosphorus and sulphur. The content of sulphur varies from 0.1 to 0.5% and averages 0.43%, whilst the phosphorus content ranges from 0.26 to 0.33 and averages 0.30%, titanium dioxide 0.18% and manganese 0.51%.

Within the South Zone, the content of total iron and magnetite iron in the ore averages 32.74 % and 23.46 % respectively. The average chemical composition of the iron ore at Sutara South Zone is given in the Table 3.2 below.

Table 3.2: Average Chemical Composition of the Ore in the South Zone

Components	Average Content, %
Fe_2O_3	28.00
FeO	15.98
SiO_2	43.10
CaO	2.64
MgO	3.37
Al_2O_3	2.21
TiO_2	0.18
MnO	0.73
P_2O_5	0.69
S	0.43
K_2O	0.36
Na_2O	0.47
Impurity percentage	1.90
Total	**100.0**

Note: the silica content of the ore is high (>40%) however, this is within reasonable limits and is not considered to present a problem.

3.4 Exploration, Drilling, Sampling and Data Verification

3.4.1 Kimkan

3.4.1.1 Historical Work

The Kimkan and Sutara Deposits were first explored in 1934-1935 and again in 1948-1953.

Of the four main ore zones, the Central (Tsentralni) and (West) Zapadni Zones have been explored in detail, whilst the Maiski and Sovkhozni Zones have only been initially explored. Geological exploration on the remaining zones has been very limited to date.

The exploration programme resulted in 260 holes being drilled on 32 exploration lines including 88,957m of drilling utilising the steel-shot method, 55,255m^3 of surface trenching, 939m of shafts and 960m of underground drives, with 12,097 samples taken. Some 6,000 samples were utilised in the last resource estimate which was carried out using manual polygonal methods in 1953-54. The Kimkan exploration data has been verified by SCI, whilst the Sutara verification is ongoing as detailed below.

During 2009 a contract was signed with Dalgeologia to carry out the geological section of the Project Technical Study Conditions report for the deposit which will be submitted to the regional authorities for approval during 2010. This report, created in accordance with the Russian System, proposes to combine the geological studies for Kimkan and Sutara which will entail additional drilling at the former taking approximately one year. In line with this, the mineral licence requirements were changed in September 2009 with revised licence terms including the postponement of K&S's required milestones for the next three years. Consequently the preparation of the technical documentation and the start of construction only needs to be done before 30 December 2013, or a further extension sought.

3.4.1.2 Confirmation Drilling Programme by IRC

Dalgeophysica, a local geological contractor, is conducting a combined process of confirmation drilling and bulk sampling for both the Kimkan and Sutara exploration licence areas. Dalgeophysica commenced confirmation drilling at Kimkan in June 2006. The Kimkan exploration plan for the 2006 season included:

- Drilling 12 boreholes for 1,156.9m (3 boreholes along each of 4 existing cross section lines) in order to confirm the geological results and consequently the cross sectional structure of the ore zones, as determined during the Soviet era; and
- Drilling up to 10 further holes in order to obtain a bulk sample of at least 13,000kg for metallurgical test purposes.

IRC has employed Resources Computing International (RCI), a UK based organisation with expertise in Russian geological and exploration evaluation, to evaluate the results of the drilling programme.

The main conclusions from the RCI report on the work to the date of writing this report are as follows:

- Results have been received from the on-going confirmation drilling programme at Kimkan, which broadly substantiate the previous drilling campaigns; and
- From the report, drill hole logs, and laboratory assay data received, it is clear that the good quality of magnetite/haematite ore is confirmed on both eastern and western ore zones.

Source: "Review Of Exploration & Development Projects Within IRC's Portfolio", Resources Computing International Ltd, Sep-06. Competent Person: Dr. Stephen Henley PhD, FGS, FIMMM, CEng

The confirmation drilling programme for the Kimkan deposit was completed in December 2006 and subsequently Dalgeophysica has moved on to the Sutara exploration licence area. The results of the drilling have been incorporated into a new database which has subsequently been used to create a Micromine model of the deposit.

Additionally, all required geotechnical exploration for the new rail connection between Izvestkovoye station and the process plant site, a distance of 4.3km, was completed in March 2009.

3.4.2 Sutara

3.4.2.1 Historical Work

The volume of historical exploration works is given in Table 3.3 below.

Table 3.3: Historical Exploration Works at Sutara

Work Undertaken	Units	Quantity
Shafts with section 6.0 m^2	m	67.7
Cross cut with section 2.7 m^2	m	174.4
Drilling—Steel Shot Method	m	39,796
a) Reconnaissance	m	34,165
b) Auxiliary	m	996
c) Hydrogeological	m	4,635
Test Pits	m^3	151
a) Reconnaissance	m^3	108
b) Hydrogeological	m^3	43
Trenching	m^3	10,735
Core tests	m	3,222
Fissure tests		263
Metallurgical tests		13

3.4.2.2 Confirmation Drilling Programme by IRC (2007)

At the time of the site visit by WAI in February 2010, Dalgeophysica had two Longyear LM75D wireline drill rigs in operation at Sutara, located in the South Zone drilling in-fill drill holes on ore body 1.

> ***WAI Comment:*** *The new drill rigs observed were both functioning on two — 12 hour shifts, drilling an average of 30 – 40m per shift. The core was inspected and recoveries appeared to be of the order of 80 – 90%. The core was well dressed and laid out in their storage boxes. Inspection was made of the core storage facilities which appeared to be adequate and fit for purpose. The drill logs were concise and recording of both in-hole lithological and geophysical data was considered excellent.*
>
> *After logging and data recording, the core is split into two with diamond saw, with half of the core retained in the box at site, whilst the other half is transported to Blagoveschensk for assay.*

3.5 Mineral Resources

3.5.1 Kimkan Micromine® Block Model

An updated resource model was produced in July 2008 for Kimkan by RJC Consulting based in St. Petersburg. Initial data provided to RJC Consulting by IRC included copies of reports, scanned images of the borehole surveys carried out in 2006, a digital database comprising borehole, trench and underground works samples for the Central, Western, Maisky and Sovkhoznyi zones and a topographic surface plan.

> ***WAI Comment:*** *WAI is satisfied that a suitable methodology has been applied to the geological interpretation of Kimkan. However, WAI is of the opinion that there is scope to improve the robustness of the grade estimation, and there is upside potential if this improvement is performed.*

3.5.1.1 Resource Classification

Although resources for Kimkan have been reported in accordance with the guidelines of the JORC Code (2004), holes drilled between 1948-1953 lack any down hole survey data and as such impact upon the classifications which can be assigned to the deposit, limiting them to *Indicated* and *Inferred* Resources only.

3.5.1.2 Mineral Resources

A summary of the Mineral Resources for Kimkan estimated by RJC Consulting in July 2008 in accordance with the guidelines of the JORC Code (2004) is shown below in Table 3.4 for a 25% Fe_{total} C.O.G..

Table 3.4: Kimkan Mineral Resource Estimate
In accordance with the guidelines of the JORC Code (2004) — 25% Fe_{total} C.O.G.

Orebody	Resource Classification	Mineral Resources	Fe_{Total}	Fe_{Total}
		(Mt)	*(%)*	*(Mt)*
Central Zone	*Indicated*	99.665	34.31	34.195
	Inferred	14.977	33.25	4.980
Western Zone	*Indicated*	51.060	33.49	17.100
	Inferred	43.044	33.63	14.476
Maisky Zone	*Indicated*	15.101	32.01	4.834
	Inferred	20.692	31.86	6.592
Sovkhoznyi Zone	*Inferred**	4.408	30.17	1.330

Note: *Prepared by RJC, 2008. As no ore extraction took place and no resource/reserve update has been performed since that date, the above statement remains valid as at the date of this CPR.*

* For a description of the categories of *Measured*, *Indicated* and *Inferred* JORC-Compliant Mineral Resources, and the level of confidence attributable to each category, please refer to the section headed "Classification of Geological Resources and Reserves — Reporting of Mineral Resources in accordance with the JORC Code (2004)" in this report.

> ***WAI Comment:*** *Whilst the Mineral Resource statement above was produced in 2008, WAI adopts the calculation as valid as of the date of this CPR. No material change has occurred since that date which would affect the Mineral Resource statement.*

3.5.1.3 WAI Review of the Kimkan Micromine® Model

WAI has undertaken a review of the resource estimation methodology and resultant resource model for the Kimkan deposit. The following data were provided for the review by RJC Consulting:

- Block Model in CSV format;
- Mineralisation and waste lens wireframes; and
- Drill hole and trench assay, collars, and survey data in CSV format.

WAI is satisfied that a suitable methodology has been applied to the geological interpretation. WAI does have concerns regarding the estimation of lower grade areas of the model; however, it is the opinion of WAI that the concerns do not significantly impact upon the global resource estimate.

Based on the review by WAI of the RJC Kimkan model, WAI is of the opinion that the Mineral Resources should be limited in classification to *Indicated* and *Inferred* Resources (and this report has adopted this methodology and classification throughout).

3.5.2 Sutara Resource Estimate (WAI 2009)

WAI prepared a Mineral Resource estimate for Sutara in July 2008, based on historical drill data and a limited amount of new drilling. In 2009, an update of the Mineral Resource statement was performed. This update included a total of 70 new drillholes, additional to the 170 holes utilised in the July 2008 estimate.

Table 3.5, below details the results of the WAI 2009 Mineral Resource estimate for Sutara, prepared in accordance with the guidelines of the JORC Code (2004), at the cut-off grade of 18 per cent. Fe_{total} respectively.

Table 3.5: Sutara Mineral Resource Estimate
In accordance with the guidelines of the JORC Code (2004) — 18% Fe_{total} C.O.G.

Zone	Resource Classification	Mineral Resources (Mt)	Fe_{Total} (%)	Fe_{Magn} (%)	Fe_{Total} (Mt)
No1	*Measured*	136.1	32.79	21.80	44.6
No1	*Indicated*	147.1	32.65	21.66	48.0
No1	*Inferred*	25.5	31.99	22.43	8.17
	Total	**308.7**	**32.47**	**21.96**	**100.8**
No2	*Measured*	26.80	30.9	18.0	8.28
No2	*Indicated*	42.80	30.7	17.5	13.12
No2	*Inferred*	30.00	30.4	17.0	9.13
	Total	**99.60**	**30.7**	**17.5**	**30.53**
No3	*Measured*	4.89	32.3	17.3	1.58
No3	*Indicated*	4.29	32.1	16.7	1.38
No3	*Inferred*	0.37	32.0	16.2	0.12
	Total	**9.55**	**32.1**	**16.7**	**3.07**
No4	*Measured*	27.87	32.3	19.5	9.00
No4	*Indicated*	36.76	32.4	19.8	11.90
No4	*Inferred*	9.66	30.7	17.9	2.97
	Total	**74.28**	**31.8**	**19.1**	**23.87**
	Total *Measured*	**195.66**	**32.45**	**20.84**	**63.46**
	Total *Indicated*	**230.95**	**32.24**	**20.5**	**74.40**
	Total *Inferred**	**65.53**	**30.97**	**19.24**	**20.39**
	Total	**492.14**	**32.00**	**20.52**	**158.27**

Note: *Mineral Resources are presented as of 01 November 2009.* As no ore extraction took place and no Resource/Reserve update has been performed since that date, the above statement remains valid as at the date of this CPR.

* For a description of the categories of *Measured*, *Indicated* and *Inferred* JORC-Compliant Mineral Resources, and the level of confidence attributable to each category, please refer to the section headed "Classification of Geological Resources and Reserves - Reporting of Mineral Resources in accordance with the JORC Code (2004)" in this report.

3.6 Ore Reserves

The KSG Feasibility Study (2008) (carried out by Giproruda and produced by PHME) included resource and reserve estimations under the Russian System, open pit design, processing flowsheet design, financial analysis and other required elements of a feasibility study.

3.6.1 Pit Design Parameters

The open pit design for Kimkan and Sutara was carried out in 2008 by Giproruda for PHME using the RJC geological block models. The pit boundaries were designed with an allowance made for the construction of the Chita-Khabarovsk road, which excluded 22.16Mt from the resources of the deposits. Restrictions were also applied due to the proximity of the existing railway, which encroaches upon the zone of influence of blasting (estimated to be 400m), resulting in alteration of the pit boundary. The parameters applied in the pit design and used in the reserve calculation are outlined in Table 3.6.

Table 3.6: K&S Pit Design Parameters
Source: PHME Open Pit Design (2008)

Parameters	Units	Values	
		Kimkan Central	Kimkan West Phase 1
Pit Dimensions at Surface			
Length	m	2,400	3,300
Width	m	780	360
Pit Depth			
Northern Extent	m	—	—
Centre of Pit	m	280	—
Southern Extent	m	—	150
Ore Losses	%	3.0	
Dilution Factor	%	3.0	
Ore Reserves	t	83,600,000	23,200,000
In-situ Ore Density	t/m^3	3.4	3.3
In-situ Waste Density	t/m^3	2.7	
Overburden Removal	m^3	115,800,000	20,700,000
Total Rock Mass Removal	m^3	140,400,000	27,700,000
Stripping Co-efficient	m^3/t	1.38	0.90
Stripping Ratio	t/t	3.74	2.42
Overburden Face Width	m	46	
Ore Face Width	m	54	
Bench Height	m	10	
Product Price	US$/t concentrate	80	
Transportation Costs	US$/t concentrate	6.80	
Royalties	US$/t concentrate	1.66	
Recovery		79.62	
Overall Expenses	US$/t concentrate	2.04	
Excavation Cost: Ore	US$/t	0.90	
Waste	$US\$/m^3$	2.44	

WAI Comment: *WAI considers that the mining parameters presented above fall within the expected range of values for such an operation. WAI has also reviewed the provided geotechnical information and confirms that the parameters used are achievable, safe and economically efficient, and in addition can be considered current.*

3.6.2 Summary of Reserves

The mining schedule is based on Russian System-approved reserves, as only reserves approved according to Russian System (e.g. A, B and C categories) can be planned for extraction under Russian Regulations.

The Russian System reserve estimation for Kimkan and Sutara performed by PHME in 2008 was classified in accordance with the Russian System, as previously published by Petropavlovsk.

WAI did not perform an optimisation or reserve estimate for Sutara, as the exploitation of this deposit is scheduled to start during year 11 (2023) of project development, meaning that it is likely that a change of economical environment will mean it is necessary to review the reserve statement.

3.7 Mining and Infrastructure

3.7.1 Introduction

In 2008, WAI performed a review of the KSG Feasibility Study (2008), produced by PHME, and considered the information presented in the document to be robust. The feasibility study considered 2 stages of project development:

Stage I — exploitation of the Kimkan West Phase 1 and Kimkan Central deposits followed by combined exploitation of the Kimkan Central and Sutara deposits;

Stage II — combined exploitation of the Garinskoye and Sutara deposits (with Garinskoye pre-concentrate to be treated at the same plant as Sutara).

In 2009, IRC separated Stage I into a stand-alone K&S project, with a corresponding feasibility study being completed (K&S Feasibility Study (2009)). This mining section is based on a review of both documents, supported by WAI's own review, estimations, assumptions and conclusions.

3.7.2 Mine Design and Optimisation

3.7.2.1 Pit Design and Parameters

As mentioned above, open pit design for Kimkan and Sutara was carried out in 2008 by RJC, and WAI considers this design remains valid. The parameters applied in the pit design and used in the reserve calculation are outlined in section 3.6 above.

3.7.2.2 Mining Schedule

The operating schedules for Kimkan and Sutara are closely linked. Initial production is scheduled to begin at Kimkan in 2012, ramping-up to a combined total production of 10Mtpa of ore. During 2023, production at Kimkan will reduce, whilst pre-production at Sutara commences, and by 2024, the total 10Mtpa extraction will have transferred to Sutara. A summary of production at Kimkan and Sutara is shown in Table 3.7 below.

Table 3.7: Kimkan and Sutara Estimated Production Schedule Summary

Project Year		2012	2013	2014	2015-2022	2023	2024-2036	2037-2049	2050
Kimkan Ore	Mtpa	2	8	10	10	6.8	—	—	—
Sutara Ore	Mtpa	—	—	—	—	2.9	10	10	7.8
Total Ore	**Mtpa**	**2**	**8**	**10**	**10**	**9.7**	**10**	**10**	**7.8**
Kimkan Concentrate	**Mtpa**	**—**	**3.2**	**3.2**	**3.7**	**2.5**	**—**	**—**	**—**
Sutara Concentrate	**Mtpa**	**—**	**—**	**—**	**—**	**1.1**	**3.7**	**3.2**	**2.5**

3.7.3 Mining Method

It has been proposed that mining at the Kimkan Deposit and Sutara Deposit be carried out by conventional open-pit mining techniques. The principal mining equipment will consist of electric rotary drills for blast-hole drilling, electric rope shovels for ore extraction, diesel-hydraulic excavators for waste excavation and diesel dump trucks for hauling ore to the crushing plant and waste to surface stockpiles.

3.7.4 Proposed Mining Fleet

The proposed mining fleet incorporates electric (Atlas Copco DML-E HP) drill rigs with 203mm drill diameter for the majority of blast holes. ROC L8 (130mm) drills will be used for pit pre-splitting.

EKG-5A bucket shovels (5.2m^3 capacity) are to be used for loading ore. Overburden will be excavated by Liebherr ER-9250 hydraulic excavators with 15m^3 bucket. Overburden will be transported to the waste dumps by Belaz-75131 (130t) trucks, with ore being transported by smaller Belaz-7555B (55t) trucks.

In addition to drills, shovels and trucks, the other items of equipment to be employed include bulldozers (cleaning duties around the shovels and compaction of the tips), graders (road maintenance), water tankers (dust suppression), fuel tankers and lubrication trucks, front-end loaders (material re-handling) and explosive mixing and pumping trucks.

The total proposed equipment fleet at Kimkan consists of 71 items of plant (52 at Central, 19 at West). The Sutara equipment fleet will comprise some 55 items of plant and machinery.

> ***WAI Comment:*** *WAI considers the equipment selected for purchase is well suited to the intended purpose. Where CIS-made equipment has been selected, it should be noted that while productivity is generally lower, the capital costs of CIS mining equipment are also generally much lower than the equivalent western-made equipment and are suitable for purpose.*

3.7.5 Working Hours

The KSG Feasibility Study (2008) proposes that operations at the Kimkan and Sutara pits will take place over 350 days per year, 7 days per week. There will be two 12-hour shifts per 24-hour period with personnel receiving a 1 hour lunch break during each 12-hour shift.

3.7.6 Dewatering/Pit Drainage

3.7.6.1 Kimkan

The estimated water inflow at Central Kimkan is 141m^3/hr from precipitation during warm periods of the year and 581m^3/hr from ground water. The maximum water inflow is expected at the fault which lies between the ore horizon and the Londokovskaya limestones.

The estimated water inflow at West Kimkan is 119m^3/h from precipitation during summer and 162m^3/h from ground water.

Dewatering measures will include off-boundary pit drainage with boreholes and in-pit two-stage pumping.

3.7.6.2 Sutara

It is anticipated that the majority of water inflow into the Sutara pit will come from groundwater sources and precipitation. Surface run-off is expected to be minimised by the construction of ditches on surface. The expected summer water inflow at Sutara is 547m^3/hr from precipitation and 1,284m^3/hr of groundwater.

In order to minimise inflow into the pit, boreholes will be drilled to a depth of 150m along the pit perimeter, each equipped with a EUB8-40/150 submersible pump, capable of pumping 40m^3/h. It is anticipated that water entering the pit will be collected in two mine water sumps, and pumped out using a 100-550m^3/h, PPU-550 mobile pumping station.

3.7.6.3 Sutara River Diversion

The Sutara River is a major drainage system for seasonal flood waters. Maximum flow occurs during summer months and can be expected to reach up to 1,370m^3/hr. In winter, flow is negligible. A bypass channel for the Sutara River will be constructed on the western side of the pit, at a distance of 200m from the final pit outline, and a dam constructed to block the original route of the river at the start of the bypass channel. Due to the size and type of machinery crossing the dam, the width of the top of the dam will be 20m, with slope angles of 1:4 upstream and 1:2 downstream. A retaining wall will also be constructed, running along the eastern bank of the diversion to afford further protection to the pit.

> ***WAI Comment:*** *WAI considers that the methodology of reducing water inflow at the Sutara pit by construction of boreholes for pumping to be appropriate. WAI has studied the relevant data and is satisfied that the provisions for dewatering both the Kimkan and Sutara Deposits are suitable and adequate.*

3.7.7 Operating Costs

The major operating costs for Kimkan and Sutara averaged over the life of the project were estimated within the K&S Feasibility Study (2009). Table 3.8 summarises these costs by activity.

Table 3.8: Operating Costs
Source: K&S Feasibility Study (2009)

Cost items	US$/t ROM
Drilling	0.22
Blasting	1.01
Loading	0.75
Hauling	1.02
Dumps	0.23
Pit sump	0.06
Pit maintenance	0.51
Services of auxiliary shops	0.80
Total	**4.61**

WAI Comment: *WAI considers that the above costs estimates remain valid as of June 2010, however it is likely that mining costs will increase over the life of the mine as wage rates and energy costs will almost certainly increase in real terms as the economies of both the region and Russia continue to grow. Part of this cost escalation should, however, be offset by productivity increases over the project life.*

The main factors which influence the mining cost are fuel/energy, maintenance, labour, consumables and explosives. WAI believes that in the case of Kimkan and Sutara, labour and fuel/energy cost estimates are below average and as such justify a lower overall mining cost.

3.7.8 Capital Costs

The key figures of the required capital expenditure estimates, presented in the K&S Feasibility Study (2009) are as follows:

- US$194.5M — construction and installation;
- US$177.9M — equipment; and
- US$27.6M — installation of equipment.

The estimated capital cost of the construction and purchase of equipment for the Stage I facilities totals US$400.0M.

The capital investments break-down by item are as follows (quoted from the K&S Feasibility Study (2009)):

Table 3.9: Estimated Capital Investment Break-down for K&S

Industrial Site	TOTAL US$'000
External Infrastructure	8,538
Internal Infrastructure	22,698
Shaft camp site	24,018
Industrial site of the Intake Facilities	991
Site of the Ore Mining and Processing Integrated Works	24,697
Industrial Site of the Izvestkovaya railroad station	16,767
Industrial Site of the Promyshlennaya railroad station	10,632
Industrial site of the processing plant	213,816
Industrial site of the TMF	9,146
Industrial site of the mining complex	68,703
GRAND TOTAL	**400,000**

Note: CAPEX estimates are based upon the PHME KSG Feasibility Study (2008) produced in 2008, and updated by PHME in 2009. This study was reviewed by WAI and used a combination of contractor and supplier quotations, combined with cost estimates derived from first principals which WAI considers to remain valid at the time of this CPR.

Table 3.10: Capital Investment by year (US$M)

Deposit	2010	2011	2012	2013	2021	2022
Kimkan	77	146	146	30		
Sutara					100	61
Total	**77**	**146**	**146**	**30**	**100**	**61**

***WAI Comment**: WAI has reviewed the capital costs estimate, and found the method of evaluation to be appropriate and conducive to a high level of accuracy. The capital costs estimate remains valid as at the date of this CPR.*

3.7.9 Transport

The following section highlights the major on- and off-site transport requirements and issues at Kimkan and Sutara.

The Trans-Siberian Railway passes within 0.5km of the north-eastern extent of the site and the closest station, Izvestkovaya, is approximately 6km north-east of the Kimkan Central pit. The western side of the site is intersected by the old Chita-Khabarovsk Federal road. A new road has been constructed that bypasses the mining area.

The majority of produced concentrate will be transported through the Izvestkovaya railway station on the Trans-Siberian Railway. The railway lines from Izvestkovaya station have been designed by the Daligiprotrans Institute as a part of the KSG Feasibility Study (2008). The total length of single-track railway from the Kimkan site to Izvestkovaya is 5.6km. The Izvestkovaya station will be improved and upgraded to provide sufficient access for transport.

A new station (Promishlennaya) will be built at the mine site. This station will include a 2-track loading and unloading facility, and sidings to allow access to coal, fuel and lubricants storage areas, and to the explosives and equipment unloading platform.

IRC has confirmed that the branch line from the main Trans-Siberian Railway to the mine site will not be electrified, and will be served by diesel locomotives. Once shunted on to the main line, trains will be hauled by electric locomotives.

Estimated rail transportation tonnages are shown in Table 3.11 below.

Table 3.11: Rail Transport Utilisation

Name of cargo	Number per estimation year (All data presented in tpa) 5th year
Incoming	
Metal equipment	450
Spare parts, open pit and technological equipment	2,150
Engineering materials (tyres, conveyor belt, lining, balls etc.)	7,400
Coal	50,000
Building materials for the current repairs	650
Fuel and lubricants including:	40,470
—diesel fuel	37,000
—petrol	350
—lubricants	3,120
Explosives and ammonium nitrate	15,000
Food products	6,200
Other cargo	19,750
Total — Incoming	**142,070**
Outgoing	
Iron-ore concentrate	3,220,000
Scrap metal	1,000
Industrial waste recycled	4,000
Total — Outgoing	**3,225,000**
Total Movement of Material	
Incoming & Outgoing	**3,367,070**

Note: IRC, 2010

Ore, waste and products from Garinskoye will also be transported to the Kimkan processing plant by conveyor and rail, at a rate of 7.2Mtpa. In addition, the final product from Garinskoye will also be delivered to the consumer by rail, at a rate of 8.2Mtpa. Finally, 0.3Mtpa of consumables and supplies will be delivered to the Kimkan-Sutara site using the rail network.

The designed single-track railway on the branch line will allow movement of the required capacity of materials.

> ***WAI Comment:*** *WAI considers IRC's rail transport plans to be sound, with suitable spare capacity available for the planned material movements.*

3.7.9.1 Conveying of Sutara Ore

Ore mined at Sutara will be transported to the processing plant at the Kimkan open pit via a 15km conveyor from the crushing plant at Sutara. The belt width has been specified as 800mm, running on two 41mm steel cables and powered by head (2,100kW), intermediate (1,200kW) and tail (660kW) drives. The belt speed is expected to average 4.7m/s.

Based upon the belt specifications, the KSG Feasibility Study (2008) suggests the belt capacity to be in the region of 1,850tph, and thus would be required to operate for 5,420h/year to achieve the 10Mtpa production target.

> ***WAI Comment:*** *Given the width of belt to be used and the belt speed specified, WAI considers the conveyor to be well suited to the operation and capable of transporting the required 1,850tph. Although it is specified that the conveyor will run for 5,420h/year at 1,845tph in order to achieve a total throughput of 10Mtpa, IRC have confirmed that the actual operating hours of the conveyor will be 7,700h/year at 75% capacity in order to bring conveyor operations into line with in-pit and crushing operations. WAI considers this methodology to be suitable provided that a surge pile of material is maintained to ensure there is always a feed for the conveyor and processing plant.*
>
> *The 15km conveyor belt specified for the Sutara operation is considered to be relatively long, but by no means unusual. Conveyors up to 30km in length have been constructed and used in cold climates without significant issues.*

3.7.10 Current Activities and Infrastructure

K&S is in an early stage of development, although the site is currently being prepared for major construction works. Some stripping works are currently taking place, but the main purpose of these activities is to provide construction materials (gravel) for other areas of the site.

All stripping is performed by contractors, and the only IRC-owned equipment present at the site is building and construction machinery.

Currently building and construction is focused on the accommodation facilities (comprising two blocks for 200 people each, one block commissioned), preparation of processing plant site (earthworks), explosives storage (earthworks), ash dump (earthworks), pulp-line (earthworks) and access roads. Access roads are also close to completion.

Construction of the first section of the permanent accommodation camp commenced in March 2009 consisting of two accommodation blocks (for 200 people each) and an administration block with the camp expected to be fully complete by the end of 2010, accommodating around 1,500 people.

These preparation works comprise a large amount of soil stripping and tree/vegetation removal. Soils are stored in specifically arranged places and wood is used, where applicable, for house, furniture and other construction.

3.8 Mineral Processing & Metallurgical Testing

3.8.1 Introduction

The KSG Feasibility Study (2008) proposed the development of a concentrator located at Kimkan to beneficiate iron ores from Garinskoye, Kimkan and Sutara. Garinskoye ore would be pre-concentrated at a rate of 10Mtpa at the mine site and then transported to Kimkan by conveyor and then on by rail. A concentrator was to be constructed at Kimkan to process:

- 7.26Mtpa pre-concentrate from Garinskoye; and
- 10Mtpa iron ore from Kimkan and Sutara.

WAI reviewed this study and requested Corus Consulting (CC) to review and comment upon the 'Process Plant' sections of the study. This review includes beneficiation of the ores to produce iron ore concentrates and the production of 'iron', both for sale in north-eastern China or Russia.

IRC now intends to implement the project in three stages:

Stage 1 — the development only of the Kimkan deposit and the construction of a process plant with a capacity of 10Mtpa of the ore by 2013. This plant will produce 3.22Mtpa of iron ore concentrate with the average grade of not less than 65% Fe. The capital investment for Stage 1 is estimated to be US$400.0M. The total current estimated operating costs for Stage 1 at Kimkan are estimated to be US$38.79/t of concentrate sold.

Stage 2 — the development of the Garinskoye deposit complete with a crushing and screening complex, with a capacity of 10Mtpa of ore by 2016, which will be constructed at the Garinskoye site. The crushing and screening complex will produce approximately 7.3Mtpa of preconcentrate at 47.8% Fe which will be transported by conveyor and rail to the processing plant at Kimkan for further beneficiation. This will require that the processing plant at Kimkan be expanded and additional infrastructure be built for processing of the Garinskoye pre-concentrate.

After expansion, the Kimkan processing plant will produce 8.3Mtpa of iron ore concentrate with a grade of not less than 65% Fe. The current estimated capital investment for Stage 2 is US$353M. The total operating costs for Stage 2 are estimated to be US$44.18/t of concentrate delivered to the PRC border.

Stage 3 — the construction of a metallurgical complex consisting of 5 ITmk3® modules with a total capacity of 2.5Mtpa of DRI and consuming 3.75Mtpa of concentrate. This metallurgical plant would be constructed adjacent to the processing plant at Kimkan. The remaining product 4.55Mtpa of 65%Fe iron ore concentrate will be sold. At this stage of development, in 2023, mining will commence at the Sutara deposit. The current estimated capital investment for Stage 3 is estimated to be US$1,066M. The total operating costs of Stage 3 are estimated to be US$280.02/t of DRI delivered to the PRC border.

The duration of each stage will depend upon the availability of financial investment resources and the commercial viability of building and operating an ITmk3 plant.

3.8.2 Previous Testwork on the Kimkan and Sutara ores

Laboratory testwork studies have been conducted during the period from 1934 to 1972 by the Mekhanobr (Saint Petersburg) Research Institute, Uralmekhanobr (Yekaterinburg) Research Institute and in the laboratory of the Sibelektrostal plant in Krasnoyarsk. In all, 25 technological samples for Kimkan and 13 technological samples for Sutara were investigated.

The tests were conducted on all ore types but mainly on magnetite, mixed and oxidised ores. The results of the studies indicated that all of the ore types were finely disseminated ferrous quartzites. It was found that the magnetite ores could be processed by magnetic separation, but mixed and oxidised ores require more complex processing.

In 1977 the Sibelektrostal laboratory reviewed all research work of Kimkan and Sutara and established that the ores from the two deposits have similar chemical and mineralogical compositions and could be treated using the same flowsheet. In 2005, the Uralmekhanobr Research Institute carried out process design studies and developed a flowsheet for recovering both the magnetic and the non-magnetic iron minerals.

The deposits are said to be metamorphosed sedimentary-volcanic and sedimentary rocks and the principal economic minerals are magnetite and haematite. The ores are described as 'ferruginous quartzites' and similar to magnetic banded ironstones widely exploited around the world. An oxidised zone containing martite and hydrated iron oxides is present but in such a small quantity that it is deemed to be of no economic significance.

The Kimkan and Sutara iron ores comprise very fine grained magnetite-quartzite containing approximately 30% Fe, so are presumably typical of Precambrian banded ironstone.

Metallurgical testwork by Uralmekhanobr has shown that all three iron ores are amenable to pre-concentration by dry magnetic separation (DMS) of the crushed ore before fine grinding. A weight rejection of approximately 25% can be achieved whilst maintaining an iron recovery in excess of 90%, which would be generally accepted as justifying pre-concentration.

The ores have typically low iron content, as presented in section 3.3.

Importantly, an ore of this type would be expected to contain low levels of impurities, such as phosphorus and sulphur, and it is stated that their contents are low, the reported values being within acceptable limits at 0.2-0.3% P and 0.2-0.4% S.

3.8.3 Metallurgical Testwork on Kimkan and Sutara Ore

This section summarises the results of testwork by the independent testing laboratories at Mekhanobr, Uralmekhanobr and Sibelektrostal, employing crushing, grinding, dry magnetic separation (DMS) and wet magnetic separation (WMS) and flotation to test Kimkan and Sutara ores. It concludes with a tabulated comparison of results as given below (Table 3.12).

Table 3.12: Summary of Beneficiation Testwork on Kimkan and Sutara Ore

Option No	Process Ore	Products Initial Ore	Technological Indicators Output (%)	Fe Grade (%)	Recovery (%)	Crushing Size (%)
1	Ore preparation. DMS, size 300-0 mm and 12-0 mm	Initial ore	100.0	33.0	100.0	-12mm
		Pre-concentrate DMS	76.8	40.0	92.52	
		Tails of DMS	23.2	10.7	7.48	
2	Two-stage WMS processing	Pre-concentrate DMS	76.8	40.0	92.52	85%
		WMS concentrate	36.52	61.1	67.21	-0.044mm
		Tails of WMS	40.28	20.86	25.31	
3	Three-stage WMS processing	Pre-concentrate DMS	76.8	40.0	92.52	98%.
		WMS concentrate	32.2	65.8	63.82	-0.044mm
		Tails of WMS	44.6	21.36	28.7	
4	Complex magnetic-flotation scheme	Pre-concentrate DMS	76.8	40.0	92.52	98%
		Concentrate	39.38	62.5	74.13	-0.044mm
		(WMS + flotation)	37.42	16.32	18.39	
		Tails				

The full chemical analyses of the 2-stage concentrate (Option 2) and the 3-stage concentrate (Option 3) are given in Table 3.13.

Table 3.13: Analyses of concentrates of Kimkan Ore

Concentrate type	Two-Stage Process	Three-Stage Process
Particle size % <0.044mm	85	98
Chemical analysis	%	%
Fe	61.5	65.8
SiO_2	9.75	5.96
Al_2O_3	0.80	0.67
CaO	0.25	0.50
MgO	1.01	0.67
P	0.092	0.045
S	0.059	0.036

Thus the Kimkan ore can be beneficiated to a quality at which it could be sold as a concentrate to be used in blast furnace pelletising feed.

3.8.4 Flowsheet Development

The flowsheet developed for the treatment of Kimkan ores included the following operations:

- Three-stages crushing to pass 12mm;
- Dry magnetic separation (DMS) on the crushed ore to produce a pre-concentrate;

- Three-stages beneficiation of the pre-concentrate with grinding to a final size of 95% passing -0.044mm to obtain a magnetite concentrate assaying 64.5% Fe at a recovery of 78%.

3.8.5 Capacity of the Process Plant

For the first stage, the process plant will have a design capacity capable of processing 10Mtpa of run of mine ore from the Kimkan Deposit. Initially it is proposed that the plant will be fed with ore from Kimkan grading 33% Fe at a size of -1200mm and with a moisture content of 2%.

The flowsheet will consist of:

- Three stages of crushing in closed circuit to -12mm; and

- Two stages of dry magnetic separation with the primary tails accounting for 12.4% of the feed and assaying 10.8% Fe. The second stage tailings will be 10.8% of the feed weight and assay 10.61% Fe.

The plant will be operated as follows:

- Crushing and screening — 7320 hours per year (305 days on 24 hours a day); and

- Concentrating plant — 7800 hours per year (325 days on 24 hours a day).

The throughput of the crushing plant, which will be supplied by Sandvik (engineering equipment suppliers), will be 1,339t/h (dry weight). The pre-concentrate from the dry magnetic separation plant will assay 40% Fe and the tails will assay 10.7% Fe. The weight rejection, based on the design criteria, will be 23.2% and the iron recovery will be 92.5%.

Further wet processing of the pre-concentrate will involve:

- Grinding in closed circuit in order to achieve a product grading 45% passing -0.044 mm in the first stage, 75 – 80% passing -0.044 mm in the second and 95 – 98% passing -0.044 mm in the third stage;

- Desliming and thickening of classification products in magnetic deslimers;

- Three stages of wet magnetic separation with recleaning of the second and third stages of wet magnetic separation;

- Filtration using disc vacuum filters to a moisture content of 10.0%; and

- Drying of the concentrate to 2.0% moisture in rotary kilns (only in winter).

A metallurgical balance for the process is given in Table 3.14.

Table 3.14: Metallurgical Balance for the Processing for K&S Ores

Stage	Product	Weight %	Assay Fe %	Recovery Fe
Crushing and DMS Pre-concentration	Feed	100.0	33.0	100.0
	Pre Conc	76.8	40.0	92.5
	Tails	23.2	10.7	7.5
Three Stage Magnetic Separation	Pre Conc	76.8	40.0	92.5
	Concentrate	32.2	65.8	63.8
	Tailings	44.6	21.4	28.7

For the three stage process a concentrate assaying 65.8% Fe will be produced at an overall iron recovery of 63.8%.

WAI Comment. *After reviewing the 'Process Plant' sections of the K&G Feasibility Study (2008), CC concluded that the basic process flowsheet presented in the Feasibility Studies are soundly based upon the principles of mineral processing. CC noted that the pre-concentration of the crushed ore by dry magnetic separation is justified by the significant weight rejection achieved (~25%) whilst maintaining a high recovery of iron (>90%). It was further noted that the two-stage milling with intermediate wet magnetic separation to remove liberated gangue minerals represents usual and established practice for treating ores of this type, and that the different grinds are supported by results of metallurgical testwork upon the individual ores. WAI reviewed CC's work at the time that it was done and supports its conclusions.*

3.8.6 Metallisation

The KSG Feasibility Study (2008) proposes that, commencing in 2015, a portion of the iron ore concentrates will be converted to direct reduced iron (DRI) for sale to the PRC to meet the increasing demand for iron in the form of steel scrap, pig iron and DRI identified by CRU and Hatch (engineering consultants). The preferred DR process, as recommended by Hatch, is ITmk3, a proprietary process developed by Kobe Steel. (See also section 8 of this CPR.)

The balance of the blended concentrates will be sold within the PRC/Russia as 'pelletising' feed having an estimated analysis of 64.5% Fe, 0.03% P.

WAI Comment*:* *CC were not asked to critically review the market studies and price forecasts of CRU and Hatch or the financial evaluations of Hatch which have determined that the project will be highly profitable. Nevertheless, CC has assessed the proposed process route to iron and the vulnerability of the project to future changes in the market for direct reduced iron and iron ore concentrates as explained below.*

The original proposal described in the K&S Feasibility Study (2008) is that KS GOK will produce a blended iron ore concentrate (from Garinskoye and K&S) with an estimated, approximate analysis of 64.5% Fe, ~6% SiO_2, 0.03% P and 0.1% S. The analysis of this blended concentrate, whilst suitable for sale as a pelletising feed, does not meet the generally accepted specification for concentrates suitable for direct reduction which would be expected to have a very high iron content exceeding 67 or 68%, very low silica (< 3% $Si0_2$), low sulphur (<0.05%) and very, very low (<<0.05%) phosphorus. However, IRC have recognised this and intends to improve the specification of the concentrate going to the ITmk3 process as from 2015.

These specifications for DRI grade concentrates are not arbitrary but based upon the cost of converting iron ore concentrates, usually in the form of pellets, to steel especially by the direct reduction-electric arc furnace route. Low iron contents reduce the unit capacity of DRI modules and steel making furnaces. High gangue contents, such as SiO_2, incur significant additional slag volumes and costs in steelmaking. High phosphorus and sulphur incur significant additional costs in electric arc furnace steelmaking because phosphorus is very difficult to remove in the slag and sulphur may need to be removed by external desulphurisation and can even create problems in many DR processes.

These issues were well recognised by Hatch which consequently reviewed the available DRI processes and routes to iron on behalf of IRC. Their report is a competent review and comparison of available technology which concludes that only two process routes are viable;

- ITmk3; and
- Rotary hearth furnace (RHF) plus submerged arc ironmaking furnace (SAF).

The principal reasons behind this recommendation are:

- Within the ITmk3 DRI process, the pelletised concentrate is heated to a point where the iron softens to form 'nuggets' and gangue minerals, such as silica (SiO_2), melt to form a slag which separates from the iron. Also, some of the phosphorus partitions into the slag. The slag is then separated from the 'nuggets' by magnetic separation. This is a unique feature of the ITmk3 DR process; and
- In the RHF/SAF route, the SAF removes the silica and phosphorus to a molten slag. It is proposed that, should ITmk3 fail to perform as expected, the equipment, namely a RHF, could be adapted to a coal based direct reduction process followed by submerged arc iron-making to produce 'cast pig iron' instead of 'nuggets'.

In their most recent work, the testing laboratory at the Uralmekhanobr Research Institute has shown that the quality of both the Garinskoye and K&S concentrates can be improved. Consequently, IRC can, if required:

- Feed the high grade Garinskoye concentrates to the DR process; and
- Produce a higher grade concentrate from Kimkan that will not require blending before sale to iron and steelworks.

The project, therefore, becomes much more robust and no longer vulnerable to the technical performance of the ITmk3 DR process with respect to phosphorus and gangue removal. The ability to vary and improve the quality of the Kimkan iron ore concentrate means that the project is not vulnerable to the market specifications for iron ore concentrates. WAI concurs with this assessment.

3.8.7 Changes to the Proposed Project Development in the KSG Feasibility Study (2008)

The major changes made to the project since the KSG Feasibility Study (2008) was first published in October 2008 are the following:

Stage 1:

- The design and research costs of US$28.7M have been excluded from the total Capital Cost as they have been completed and considered to be 'sunk-costs';
- As a result of the detailed process plant design works performed by the Uralmekhanobr Research Institute the number of mills required at the first stage was reduced from 6 to 4 items. Additionally one thickener with a diameter of 100m was substituted for a thickener with a diameter of 50m (resulting in a reduction of capital investment). The quantity of pumping equipment was reconsidered and the construction volumes of the buildings were also reviewed.

Stage 2:

- After the plans of the Russian Railways and the investment policy of the Government of the Russian Federation became clear, the conveyor line between Garinskoye and Shimanovsk and all associated power infrastructure were excluded from the cost estimate. The concentrate arising from the Garinskoye crushing and screening complex will be transported on the Shimanovsk-Fevralsk railway which will pass in the immediate proximity of the deposit. The construction is planned to be completed in 2013 – 2014. As a result of this the capital investment for Stage 2 was reduced by US$500M.

By June 2010 the following works on the implementation of Stage 1 of the project were completed:

- All permits and approvals for construction to commence have been received;
- Geotechnical research for all construction facilities has been completed;
- Water reserves confirmed and all permissions necessary for the use of the available water resources for technical and household purposes have been obtained;
- The transfer of status of the forest lands to the status of construction lands has been completed;
- Public hearings on the project have been carried out;
- Technical specifications for making a connection to the existing electric lines and a rail connection to the Russian Railways at Izvestkovaya station have both been obtained;
- The design of the process plant has been completed;
- Construction of the first accommodation block for 200 people has been completed;

- Clearing and preparation of area for construction of the process plant, accommodation camp, temporary base and roads have been completed; and
- The office in Birobidzhan established as a base for the construction and implementation of the project is almost complete.

3.8.8 Process Operating Costs

The process operating costs are discussed in section 3.9 below.

> ***WAI Comment:*** *The treatment costs are relatively low at US$4.08/t of ore treated, reflecting the relatively low technology of the process route. Major components are electricity, maintenance and spare parts.*

3.9 Capital and Operating Costs

3.9.1 Forecast Operating Costs

The life of mine operating costs for the Kimkan & Sutara operations have been estimated by IRC as at 10 May 2010, and can be considered up to date as of June 2010. These are summarised in Table 3.15 below.

Table 3.15: Summary of Estimated Kimkan & Sutara Life of Mine Operating Costs

Cost	Unit	Total Cost	Cost/Unit US$/t	Cost/Tonne Ore US$/t
MINING				
Total Ore Mined (Kimkan)	t	106,800,000		
Total Ore Mined (Sutara)	t	270,690,000		
Total Kimkan Mining	US$	492,454,800		4.61
Total Sutara Mining	US$	1,497,781,908		5.53
Total (K&S) Mining	**US$**	***1,990,236,708***		***5.27***
PROCESSING				
Total Concentrate Produced (Kimkan)	t	38,305,600		
Total Concentrate Produced (Sutara)	t	93,212,465		
Processing Costs (Kimkan)	US$	435,744,000	11.37	4.08
Processing Costs (Sutara)	US$	1,104,090,372	11.84	4.08
Total Processing	***US$***	***1,539,834,378***	***11.71***	***4.08***
CONCENTRATE RAIL TRANSPORT				
Concentrate Transported (Kimkan)	t	38,305,600		
Concentrate Transported (Sutara)	t	93,212,465		
Transport Costs (Kimkan)	US$	314,945,328	8.22	2.94
Transport Costs (Sutara)	US$	687,907,992	7.38	2.54
Total Transport	***US$***	***1,002,853,320***	***7.62***	***2.66***
G&A				
G&A (Kimkan)	US$	64,800,000		0.61
G&A (Sutara)	US$	129,600,000		0.48
Total G & A	***US$***	***194,400,000***		***0.52***
TOTAL OPERATING COSTS				
Kimkan	**US$**	**1,307,944,128**		**12.09**
Sutara	**US$**	**3,419,380,272**		**12.56**
TOTAL OPERATING COSTS	**US$**	**4,727,324,400**		**12.53**

The operating costs in Table 3.15 are presented as a total cost over the life of the mine, per unit produced or transported, where appropriate, and as unit cost per tonne of ore mined for comparative purposes. Non-income taxes such as mineral extraction tax and property tax are excluded from the table but amount to a further US$111.0 (US$1.04/tonne) at Kimkan and US$262.7M (US$0.97/tonne) at Sutara.

The cash operating costs are also presented by category in Table 3.16 below.

Table 3.16: Kimkan & Sutara Life-of-Mine Cash Operating Costs by Category

Operating Cost Category	Total Cost[1] US$	Cost per tonne of Ore Mined US$/t	Cost per tonne of Concentrate Sold US$/t
Workforce employment and Transportation of workforce	1,990,236,708 (Mining)[2]	5.27 (Mining)[2]	15.13 (Mining)[2]
Consumables (including fuel oil) Power, water and other services	1,539,834,372 (Processing)[2]	4.08 (Processing)[2]	11.71 (Processing)[2]
On and off-site administration Environmental protection and monitoring	194,400,000	0.52	1.48
Product marketing and transport	1,002,853,320	2.66	7.63
Non-income taxes and royalties, and contingencies	373,646,841	0.99	2.84
Total Operating Costs	**5,100,971,240**	**13.51**	38.79

***Note:** Costs per tonne are based on life-of-mine tonnages from the mining schedule.*

(1) This table has been populated using data provided by IRC in the May 2010 update of the project cost model.

(2) The IRC Cost Model (May 2010) presents costs for Mining and Processing but no further breakdown between personnel, consumables and service costs.

> ***WAI Comment:*** *Mining of ore and waste rock, and processing account for some 75% of the operating costs at Kimkan & Sutara. WAI is of the opinion that the K&S operating cost forecasts have been prepared in a diligent manner and the majority of the costs are based on either direct quotations from suppliers (in the case of rail transport) or through IRC's existing operating experience.*

3.9.2 Capital Expenditure Plan

The capital expenditure required to develop the K&S project and associated facilities is required in two distinct phases, correlating with the start-up of operations at the Kimkan and Sutara open pits as demonstrated in Table 3.17.

Table 3.17: Capital Investment by year (US$M)

Deposit	2010	2011	2012	2013	2021	2022
Kimkan	74	146	146	33		
Sutara	—	—	—	—	100	61
Total	**74**	**146**	**146**	**33**	**100**	**61**

3.10 Environmental Issues

3.10.1 Review of Environmental & Social Studies

WAI was commissioned to undertake a review of environmental, social and health and safety issues relating to the development of the K&S project by KS GOK. The purpose of the review was to establish whether or not the project is in compliance with environmental and socio-economic commitments and relevant legislation and guidelines both at national and international levels.

As of February 2010, IRC has successfully carried out baseline investigations which cover the following areas:

- surface and ground water studies;
- collection of meteorological data,
- forestry aspects;
- fishery impacts;
- soils/environmental geology;
- radioactivity assessment;
- flora and fauna, including studies of Red Book species;
- presence of archaeological, cultural or historical heritage;
- presence of sites of special geological or scientific interest or other specially protected areas;
- studies of baseline concentrations in the environmental media, and
- seismicity of the region.

Baseline studies of atmospheric air quality were undertaken by "Khabarovsky CGMS RSMC" from 2007 to 2009. In 2006, geo-ecological investigations were conducted. In 2007-2008, studies of water, soils and bottom sediments (bed silt) were carried out by AmurGeologia OJSC, fauna studies undertaken by the Russia Far East Filial of the State Russian Institute for Hunting. Monitoring of the water bio-resources was undertaken by Amurribvov FGU during 2007-2008, followed by the studies of Khabarovsk Filial of "Pacific Ocean Fishery Research Center" in 2009. Additionally, radioactivity levels have been studied across the K&S area.

Water quality studies have not revealed any levels of inherent concern with the exception of the elevated albeit deemed naturally high levels of such determinants as Fe, Si, Al, Cu and Mn which are described as background levels.

Consequently, these data will be incorporated into the OVOS, which is being drafted to calculate the damage to fishery, forestry and other environmental media and the financial equivalent to be compensated to the state budget. Furthermore, socio-economic studies of the region and adjacent settlements have been conducted with a thorough record being kept by IRC for further use.

WAI Comment: *Overall, WAI considers that the methodology adopted by IRC for the baseline studies is sound, well conducted and to a high standard with the results indicating no areas of inherent concern in the existing environmental background conditions.*

However, monitoring of fauna species indicate a rather high sensitivity due to the presence of a number of Red Book species which may be potentially placed at risk from future K&S operations. WAI would therefore recommend that further monitoring of fauna species is continued by IRC to establish mitigation measures for KS GOK operations. Furthermore, regular water, snow, soil and air monitoring should be maintained throughout the life of the project.

WAI also considers that international financial authorities (such as the Financial Services Authority, or other independent non-governmental bodies) will require due cognisance to be taken of the social impacts pertaining to the project and as such, an ESIA which is currently at the stage of drafting, should also include comprehensive socio-economic baseline studies in accordance with the international requirements and best practices such as the Equator Principles and IFC Performance Standards.

3.10.2 Review and Comment on Key Environmental and Social Issues

3.10.2.1 Permitting Status

Pursuant to the existing legislation, KS GOK is required to conduct its exploration, construction and exploitation activities in accordance with these laws and regulations and to obtain necessary permits and approvals from the relevant authorities. These include the lease agreement with the State which enables design and construction works within the licence area whereby some 4.2km^2 of forest will be affected. This land had previously been used for forestry and still has potential for continued use. Forestry and mining can be complementary activities and continued potential use for forestry will feature in Mine Closure and Rehabilitation Plan.

The Technical Design, required to support construction and exploitation activities is being prepared for State approval. This design will include waste disposal limits, MAEs, MACs and MADs subject to the state approval. In 2009, KS GOK commissioned "Centre of Ecological Design" OJSC to undertake the design.

Development of the plan for the TMF has commenced and will reassess the location proposed for the TMF, since the original location necessitates a water channel diversion. The TMF design is currently being undertaken in such way that environmental risks and contamination of the Talyi Creek are minimised. The TMF will employ a closed water system, incorporating appropriate drainage measures and emergency prevention procedures.

All design documents will then be the subject of Russian State approval. A date for the submission has not been set.

IRC is currently aligning its sustainability reporting with the requirements of the Global Reporting Initiative (GRI). Consequently, a system of quantitative KPIs has been introduced, to be used for the reporting of environmental performance across company operations. KPIs for 2009 are in the course of preparation and will be reported in the 2009 Sustainability Report due in H2, 2010.

> ***WAI Comment:*** *WAI concludes that KS GOK is either in possession of relevant licences, permits and approvals or is in the process of obtaining such for future project work. WAI believes that at present, KS GOK operations are compliant with the Russian State legislation and norms.*
>
> *Furthermore, WAI believes that KS GOK is intending to adopt and follow international good practice standards in project development and would encourage that such an approach be maintained during the life of mine.*
>
> *WAI understands that the originally proposed location of the TMF with respect to the Sutara River, the Malaya Artamoniha Creek and the Talyi Creek is of concern and as such the TMF design should carefully consider the potential impact on water resources whereby quality and protection will be a high priority.*
>
> *Moreover, immediate attention to water management aspects, particularly if the diversion of the Sutara river or its tributaries is necessary, will be required and best practice waste management techniques, particularly in respect of tailings, should be adopted.*

3.10.2.2 Environmental Status

WAI understands that the project area has no special designated biodiversity or cultural interest or protection requirements. Nevertheless, the environment in the region supports various ecosystems and a sensitive aqueous environment. It requires environmentally sound regimes of the water and waste management to prevent damage being caused.

The description, classification and calculation of industrial emissions, discharges, noise and vibration levels represented in the OVOS section will form an integral part of the Design for Construction and Exploitation of K&S, and should integrate environmental protection and mitigation measures.

The area of the deposit and its primary and secondary pollution dispersion halos have been used to determine the area coverage needed to characterise the environmental background level. Results of the geo-ecological studies indicate the soils and bedrock fall below chemical component thresholds whilst the contaminants, aluminium, sodium, niobium, iron, titanium and potassium exceed the established Maximum Allowable Concentration (MAC).

> ***WAI Comment:*** *WAI considers that KS GOK has carried out the necessary studies to establish the current environmental condition of the K&S area. Potential impacts of the operations are assessed and it is IRC's intention to ensure that environmental quality does not deteriorate and that environmental media are afforded required protection.*

3.10.2.3 Management Plans, Procedures and Polices

The Ecological Code of Conduct was prepared and introduced at KS GOK in 2009, and outlines the responsibilities of the management and the workers, key aspects pertaining to protection of air, soil, surface and ground waters, forestry and vegetation, flora and fauna. The Code was drafted based on the Corporate Environmental Policy and is aimed to comply with Environmental Protection Legislation of the Russian Federation. Furthermore, KS GOK has developed a Health and Safety Policy (the "Policy") for the K&S site and its facilities and is introducing standards concerning industrial safety, emergency control and training. The Policy employs a systematic management approach (Plan-Do-Check-Act) and is aimed at continuous improvement.

The current Policy also stipulates that the existing Health and Safety Management System shall undergo continuous improvement to comply with such international standards as OHSAS 18001:1999 and the guidelines of the International Labour Organisation ILO-OSH 2001. However, introduction and implementation of standards such as ISO14001 and OHSAS18001 are not planned at the current stage of project development.

With regard to environmental protection and management, KS GOK prepares an Environmental Protection Action Plan on an annual basis where the measures aimed at minimisation of risks and potential pollution are outlined, supplemented by the performance timeframe with financial provisions and personnel in charge to implement them.

KS GOK's Social Responsibility is embedded in the agreement concluded on 07 May 2008 between KS GOK and the Administration of the Obluchensky Municipal Region which outlines the co-operation between the parties for 5 years until 2013. The parties are legally bound to cooperate in a mutually beneficial manner with the first (and largest project) being the construction of the Izvestkovaya railway station as well as other infrastructure communications. Subsequently, provision of employment (approximately 3000 jobs) for local inhabitants with education and training for the young students will be an integral part of KS GOK's community development responsibilities.

> ***WAI Comment:*** *WAI believes that the Ecological Code of Conduct prepared for the operations to date ensures that key environmental media receive protection and would recommend that this document is expanded to include monitoring, control, assessment and reporting to enable monitoring of the implementation of the Ecological Code of Conduct and identification of areas for improvement.*
>
> *WAI also considers that KS GOK is striving to satisfy both national standards and to achieve international best practice and is succeeding. The existing Health and Safety Policy and Procedures cover the aspects of implementation, management, control and reporting and are comprehensive, and sound.*
>
> *The Environmental Protection Action Plan reviewed by WAI is appropriate to KS GOK's early-stage operations and has been implemented. The Environmental Protection Action Plan is supported by the relevant budget and seems to be adequate to achieve the environmental protection measures named in the document.*

WAI considers that the existence of the agreement between the local Administration and KS GOK is a good step towards ensuring corporate social responsibility. Moreover, WAI would recommend that this document is supplemented by spend items, the relevant budgetary support and a timeline for such expenditure, once the operations are commissioned. This will define what the Administration may expect to receive for the community development and when, ad-hoc spends may also be expected to occur.

3.10.2.4 Closure and Rehabilitation

A Mine Closure and Rehabilitation Plan for the K&S project will form an integral part of the main Design document for construction and exploitation of the area licensed to KS GOK and is currently being drafted. Furthermore, progressive remediation of contaminated land is provided for in the existing Environmental Action Plan.

According to the Feasibility Study (2009), the provision for rehabilitation costs at Kimkan (Central and West pits) is US$8.7M. It should be noted that the quoted figures are subject to revision to reflect the actual costs required for such a closure and rehabilitation. The first adjustment is reported to be currently implemented as part of the preparation of the Construction and Exploitation Design.

WAI Comment: *WAI is encouraged that the allocations for the mine closure are planned to be based on real mine closure costs and considers that the budget should also include the costs of post-closure monitoring. The preparation of a Framework Mine Closure and Rehabilitation Plan, including improved cost estimates should be commissioned by IRC.*

Mine closure planning must integrate a number of concepts on a site wide basis, such as social aspects, physical and chemical stability including surface water management, management of remaining process solutions and the post-mine use of the infrastructure.

Importantly, future public health and safety should not be compromised and the after-use of the site should be beneficial and sustainable for affected communities.

3.10.2.5 Water Management

KS GOK has carried out hydrogeological studies for potable and technical supply with results showing the groundwater reserves to be sufficient for the life of mine with the water quality corresponding to the Russian standards.

The results indicate that water quality will not alter during the project development provided adequate measures are implemented to protect both surface and ground waters coupled with appropriate monitoring. Moreover, future exploitation of the groundwater reserves is not predicted to affect the water balance of the region significantly, since the estimated demand is unlikely to exceed available natural resources.

Furthermore, it is understood that the groundwater use conditions for the potable supply of KS GOK have been approved by Rospotrebnadzor, the state agency for the EAO Region.

The Water Code of 03 June 2006 stipulates that a water protection zone for the rivers and creeks should be established based on the length of those. Water bodies located in the K&S licence area (Figure 3.9 below) originate in the Culdur and Sutara river basins whilst the water tributaries potentially affected by mining and processing operations are the Sutara River, the Talyi Creek and the Malaya Artamoniha Creek. Water protection zones have been established by KS GOK and the Amur Water Management Administration and are 200m, 100m and 100m long respectively.

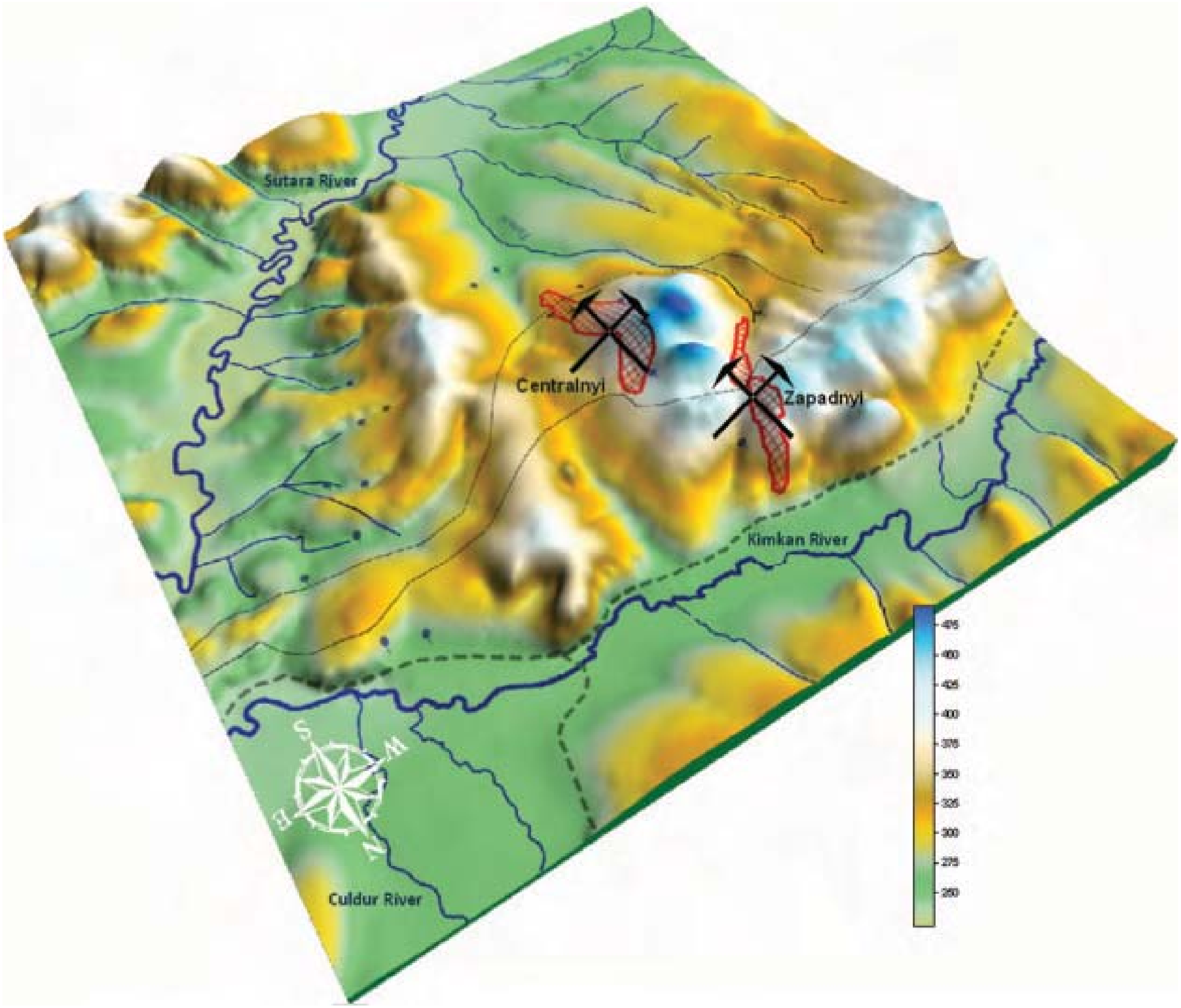

Figure 3.9: Proposed Open Pits With Respect to the Kimkan & Sutara Interfluvial Plain

It is understood that the Sutara River and Talyi Creeks may be diverted such that the development of the Zapadny area is feasible whilst the Malaya Artamoniha Creek may be affected by the TMF. Consequently the need for effective control of water management has been identified as a key issue.

Furthermore, the rivers provide water supply for each settlement in the location of the Kimkan and B.Bira river valleys with the water quality directly dependant on the river water. In these areas, water discharge to surface water bodies in the project area does not occur.

It is understood that KS GOK's sewage will be treated through plant and gravel-bed filters, with the cleaned water used for domestic purposes and/or discharged into the nearest watercourses. Dewatering of the open pits at a planned rate of 12,000m^3/day will occur with the water being recycled post mechanical, chemical and physical treatment processes to reduce pressure on natural water resources and minimise contamination.

Runoff and storm water from the boiler plant and the processing complex will be diverted to the treatment facilities which are planned to include an oil separator and a two-stage post treatment using filters.

> ***WAI Comment:*** *WAI has reviewed the reports on the hydrogeological studies carried out in the area, has studied the projected water treatment plans and management proposals, including those of the TMF, and has not identified any significant risks related to water quality and use, however, WAI would emphasise that management of the water use and quality, both in and around the mining licence, may become a significant issue.*
>
> *WAI believes that potential contamination or reduction of surface and/or groundwater availability may be a serious concern for the residents of the adjacent settlements and should be the focus of an Emergency Preparedness and Prevention Plan. The construction of an engineered surface tailings disposal facility would be expected to meet the federal design requirements and KS GOK has committed to take diligent steps to ensure compliance.*
>
> *In addition seepage management and related stability analysis should be a key consideration in design and operation of the tailings facility which should be maintained throughout its life cycle.*

3.10.2.6 Environmental Quality Monitoring

The environmental monitoring programme for the operations has been drafted in accordance with both legislative requirements and the licence agreement and was approved by the Russian State authorities and KS GOK.

Air, soil, snow, groundwater and surface water samples are taken in line with the monitoring schedule, analysed in accredited subcontractor laboratories and provide unbiased and reliable data. These data are subsequently analysed and reported to the Russian State authorities as well as at corporate level.

The determinants monitored for environmental media in general have not exceeded the established thresholds, with the exception of few elements carrying naturally high background levels, as described above.

The approved monitoring programme enables KS GOK to supplement the baseline studies and adjust monitoring practices, and requires some modifications and improvements pertaining to the air quality monitoring and waste management techniques.

> ***WAI Comment:*** *WAI believes that the baseline studies and the environmental monitoring conducted by KS GOK are adequate and well conducted; however WAI*

would recommend that the monitoring frequency for ground and surface waters is revised at the exploitation stage to provide representative data for the parameters being monitored and overall quality assurance.

WAI considers that the air quality monitoring is adequate at this stage of project development, monitoring reports do not reveal significant impacts on the air quality caused by KS GOK's operations within the area.

WAI would, however, recommend that KS GOK supplements the existing air monitoring programme with determinants such as Particulate Matter (PM10) and (PM2.5) and also determine if the project has the potential to emit any additional greenhouse gases that form part of the Kyoto Protocol to the United Nations Framework Convention on Climate Change:

- *Methane (CH_4);*
- *Hydrofluorocarbons (HFCs);*
- *Perfluorocarbons (PFCs);*
- *Sulphur hexafluoride (SF_6).*

Overall, WAI considers that the primary tool in assessing the impact of the KS GOK operation on the environment has been and will remain the environmental monitoring programme which is likely to require modifications in time.

With the proximity, slope incline and direct linkage to the rivers and creeks and the adjacent growing settlements dependant on the water supply from those, the protection of water resources and water quality and will be of paramount importance, requiring effective water management practices to be implemented.

3.10.2.7 Waste Management

Management of both domestic and industrial waste at K&S receives due cognisance. Thus, KS GOK has raised, and is in the process of raising, agreements with the relevant waste utilisation/recycling contractors for waste including liquid and solid domestic wastes, used tyres, mercury bulbs, scrap metal and others.

Waste rock is the main type of waste generated by the mining and is disposed of in constructed waste dumps and is planned to be utilised during the construction of the TMF dam walls and haulage roads.

In addition, hazard classification of production wastes is being determined, to provide the basis for the waste classification, calculation of the disposal limits and norms and the overall continuous management.

"Irgiredmet OJSC" has been commissioned to develop and conduct testing of technologies suitable for treatment of industrial liquid wastes such as open pit water, waste dumps drainage and run-off waters and the supernatant water of the tailings dam, the completion of which shall culminate in the preparation of water treatment unit design.

WAI Comment: *Overall, WAI is encouraged by IRC's strategy and the attitude toward the management techniques for both domestic and industrial waste.*

WAI considers that tailings management in general is a sensitive subject in the region. Thus, the TMF management should be a key consideration in design and operation of the tailings facility structure on a long-term basis. Protection of the aqueous medium is therefore considered a high priority and requires a significant effort and best practices.

Moreover, WAI considers that IRC has demonstrated overall good practice in waste management at the current stage of the operation and intentions for the future will be the subject of improvement. Waste Management is a key issue in maintaining ISO14001 accreditations and as such KS GOK is encouraged to retain and continuously improve its environmental performances through efficient waste management.

3.10.2.8 Social Issues

There are no indigenous peoples on the territory of the Obluchensky region. Furthermore, KS GOK has undertaken a social baseline study, the results and the statistics of which have been presented to and reviewed by WAI.

In 2009, as part of the baseline investigations, archaeological, historical and cultural studies were undertaken and identified no cultural, archaeological or historical heritage in the area of the Kimkan and Sutara valleys. In addition to that, no areas of geological or special scientific interest are present within the area.

KS GOK participates in cultural events significant at regional level, and provides necessary assistance to those in need as well as to municipal establishments. In 2009, over RUR5M was spent on health care, including purchasing equipment for schools, kindergartens, gyms and hospitals.

Public consultations have been conducted twice (on 25 June 2008 and 25 September 2009) in a diligent manner where the project development related aspects have been discussed at length and positive outcomes have been achieved. Furthermore, KS GOK is reported to have agreed to engage further with local stakeholders and to that effect has developed a Public Consultation and Disclosure Strategy (PCDS), which has been approved by the IFC, as part of an Environmental and Social Action Plan.

Nevertheless, the main document that currently regulates the relationship established between KS GOK and the local Administration of the Obluchensky Municipal Region is the agreement on cooperation, albeit with no specific budget or a timeline.

WAI Comment: *WAI considers that with the commissioning of KS GOK as a major employer in the vicinity, the local economy would receive a very significant boost. It is WAI's opinion that KS GOK has heretofore demonstrated a responsible approach towards engagement of the stakeholders. WAI believes that a formal Community Development Plan and Information Disclosure Plan should be formalised to support this but that the components required to achieve this are in place.*

WAI believes that KS GOK is in possession of all the elements required to be integrated into a holistic Social Management System whereby KS GOK shall establish procedures to monitor and measure the effectiveness of initiatives. In addition to recording information to track performance and exercising relevant operational controls, compliance and progress toward desired outcomes should be verified and the necessary corrective and preventive actions introduced where necessary.

Furthermore, WAI believes that potential risks posed to KS GOK personnel, communities and the natural environment can be reduced via the development of a detailed Environmental and Social Management System. The potential for community exposure to communicable/respiratory diseases that may result from the project activities could be minimised through implementation of additional dust, noise and vibration control measures.

WAI advises that the introduction, implementation and maintenance of ESMS would be required to ensure continued compliance with the international best practices, such as Equator Principles and IFC Performance Standards.

3.10.2.9 Health and Safety Issues

An Integrated Plan for the Health Protection, Industrial Safety and Environmental Security has been developed by KS GOK for 2010 and addresses the key areas pertaining to protecting environmental and social media through implementation of organisation, management, control and reporting measures both at corporate and project level in line with the established timeframe.

No accidents are reported to have occurred at KS GOK operations. Reporting on the injury rates has been consistently provided to IRC.

WAI Comment: *WAI considers that the Integrated Plan developed by KS GOK is comprehensive and supported by an adequate budget and relevant timeframes. Based on the data which have been made available for review and the site walkover, WAI considers that KS GOK is generally compliant with the state health and safety requirements.*

WAI would note that community health and safety should not be compromised and potential concerns associated with the mining activities, transport and handling of hazardous goods, impacts to water quality and quantity and potential for respiratory illnesses should be minimised through adopting modern techniques and international best practices.

3.11 Conclusions

The Kimkan and Sutara project is a Stage-1 phase of a considerable medium to long term iron ore project, which benefits from excellent access to the major transport infrastructure in Russia. The two deposits host a large reserve and resource base that is proposed to be operational in 2013.

4 GARINSKOYE AND GARINSKOYE FLANKS

4.1 Property Description and Location

4.1.1 Overview

The Garinskoye iron ore deposit is one of the few large iron ore deposits in the Russian Far East which has been explored and studied extensively during the Soviet era. It has a favourable geographic position in relation to probable iron ore consumers in northern PRC.

Garinskoye is currently an advanced exploration project. No mining has taken place on the site. IRC has completed scoping studies and the KSG Feasibility Study (2008) (which also included K&S) detailing future plans. The licence for Garinskoye is held by LLC GMMC, in which IRC has a 99.58% interest.

Giproruda, a Russian mining engineering services institute majority owned by IRC, was employed to conduct the geotechnical analysis and pit design and optimisation work within the scope of works for the KSG Feasibility Study (2008) produced by PHME. Having reviewed all of the available data relating to the Garinskoye mine in the KSG Feasibility Study (2008), WAI considers all aspects of the mining project to be technically and financially sound as of the date of this CPR.

The Garinskoye Flanks component of the deposit comprises an area covered by a licence and includes some 3,530km^2 immediately surrounding the current Garinskoye licence area. IRC is currently preparing and reviewing the exploration programme for this deposit.

4.1.2 Location

The Garinskoye Deposit is situated in the Mazanovsky Administrative District, Amur Region and lies approximately 300km from the regional capital of Blagoveshchensk as shown in Figure 4.1 below. Garinskoye is some 140km northeast from the city of Shimanovsk, on the Trans-Siberian railway line, and 65km southwest of the BAM Railway line. The nearest community is the Mayskiy settlement, 45km to the southeast.

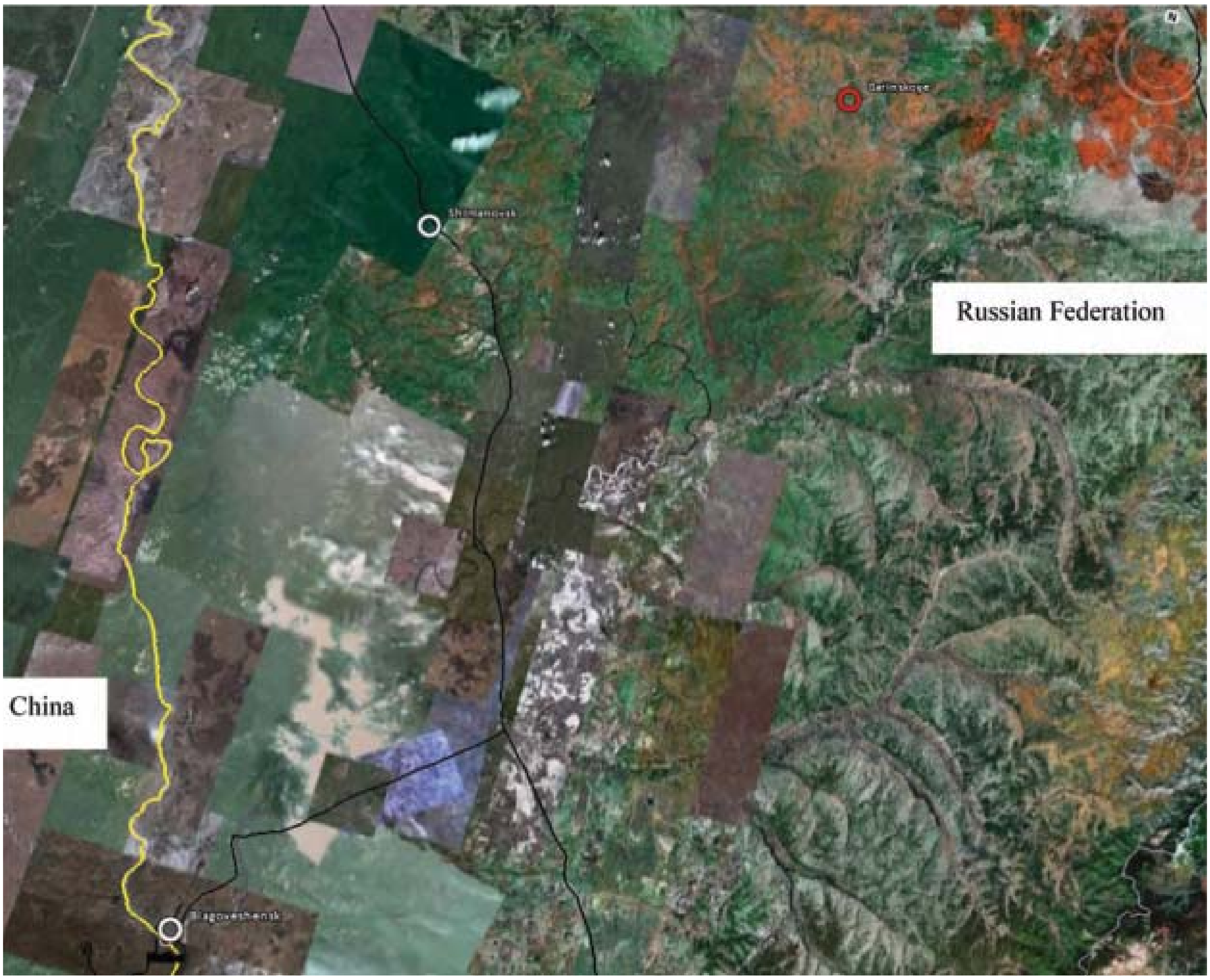

Figure 4.1: Location of Garinskoye Deposit relative to China, Blagoveshensk and Shimanovsk (BAM Railway shown in black)

4.1.3 Mineral Rights and Permitting

The Garinskoye licence is held by LLC GMMC, in which IRC has a 99.58% interest.

The Garinskoye licence covers an area of 11.2km^2, and is shown in Figure 4.2 below:

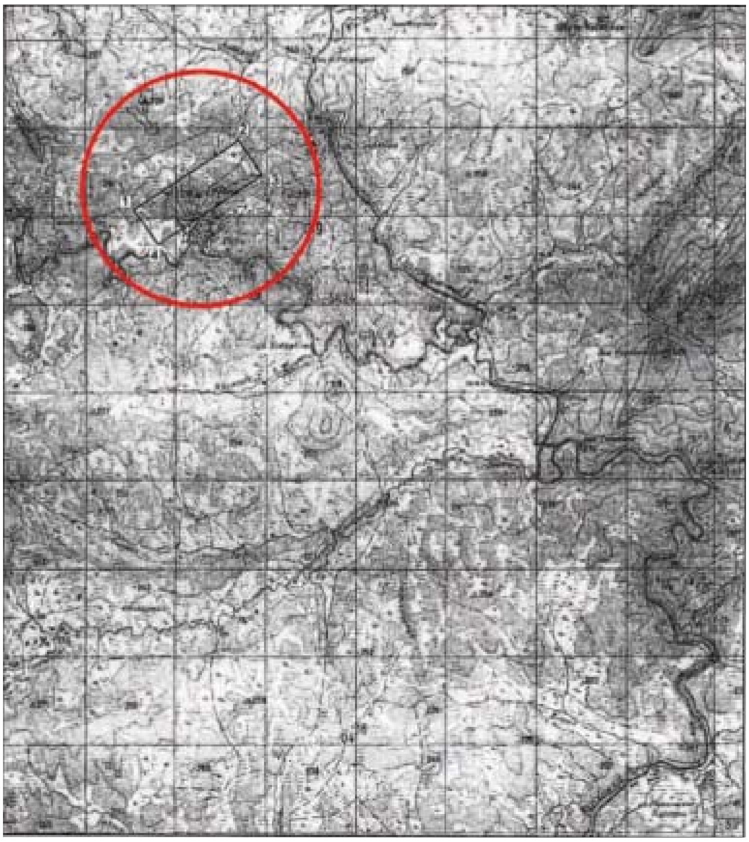

Figure 4.2: Outline of Garinskoye Licence Area

Co-ordinates for the licence outline are given in Table 4.1 below.

Table 4.1: Co-ordinates of the Garinskoye Licence Boundary

Point No.	Northing (N)	Easting (E)
1	52°35'00"	129°05'30"
2	52°36'45"	129°09'30"
3	52°35'45"	129°10'30"
4	52°34'00"	129°06'30"

> ***WAI Comment:*** WAI has inspected the licence for Garinskoye and believes the boundaries as indicated on Figure 4.2 are correct and in good order.

4.2 Accessibility, Climate, Local Resources, Infrastructure and Physiography

The administration of the Far Eastern Federal District attributes strategic importance to the development of the Garinskoye iron ore deposit as the starting point of the exploitation of the iron ore potential of the region.

In terms of infrastructure, air transport is available from Blagoveshchensk with direct links to Moscow, Khabarovsk, Irtkutsk, Kransnoyarsk and other major cities however, the deposit requires a new access road, 60km in length, to join with the Federal road joining Svobodny to Fevralsk. A new rail connection to the Trans Siberian railway, approximately 120km in length to the southeast is also required. The new rail head will join the mainline at the nearest existing station of Shimanovsk. As of June 2010, construction of neither the road or railway had begun.

The electricity supply to the regional Amurenergo grid is available at the connection with the Federal road, which is a distance of 60km from the site.

The deposit lies alongside the Garinskoye River, a tributary of the Orlovka (Mamyn) River. The terrain is undulating with slightly sloping hills separated by broad, flat marshland. Elevations range from 250m to 500m, with the relative altitude over the valley bottom varying from 50m to 120m.

The region has a continental climate with long, cold winters (up to -47°) with light snow, and hot, wet summers (up to +39°). The average annual precipitation is 450mm, 70% of which falls in the summer season between May and September.

According to the 2002 Census the total population of the Amur Region is approximately 900,000 of which some 219,000 reside in the regional capital of Blagoveshchensk.

4.3 Geological Setting, Deposit Types and Mineralisation

The Garinskoye deposit is hosted within metamorphic Proterozoic and lower-Cambrian minerals enclosed by widely spread intrusive gabbro and granite formations. The metamorphic stratum is divided into dominant assise(1) and ore-bearing assise. The dominant assise includes the interstratified quartz-sericite (sometimes graphitic), sericite, quartz-sericite-chlorite, quartz-micaceous and other schists, metamorphosed sandstones, quartzites, crystal limestones and schistose effusive minerals. The apparent thickness of assise is 4-5km (the Kamenushinsk pyrite ores have been included into this assise).

The ore-bearing assise, which is bedded upon the dominant assise with a slight unconformity, is represented by interstratified schistose and massive albite, amphibole-albite and lime-albite minerals, magnetite ores and crystalline limestones. The apparent thickness of the ore bearing assise is approximately 1,000 – 1,200m. Within the deposit the minerals have been exposed to contact metamorphism, and part has been transformed into skarns and skarn-like minerals.

Structurally the deposit is a synclinal fold with north-eastern striking axial trace. Exploration has concentrated mainly on the northern extension of this synclinal fold, which has been explored down to 500m. The length of the ore belt is 4km with a width from 5 to 450m. The ore belt is divided into Central (1600 x 240m), Eastern (850 x 225m) and Western (1500 x 185) areas.

(1) Assise is a geological term for two or more beds or strata of rock united by the occurrence of the same characteristic species or genera.

The ore bodies are generally steeply dipping (from 70 to 80°) and consist of tabular lens-like beds whose dimensions average from 80 to 1,500m along strike, 500m down dip and from 2 to 49m in thickness. As these beds bunch closer to each other they form three ore clusters. The largest, containing 75% of the deposit resources forms the upper mineralised horizon that can be traced in the southern part of the deposit among massive greenstones rock. The cluster includes 24 ore bodies with average thicknesses from 1.6 to 49m, having strike lengths from 80 to 1,500m.

The middle mineralised horizon strikes for a total length of 1,200m and incorporates five ore bodies (100 to 1,200m length) with an average thickness of 6.4 – 14.4m. The lower horizon incorporates 25 ore bodies from 60 to 1,400m length with an average thickness of 12m. Figure 4.3 illustrates the general arrangement of the Garinskoye deposit showing the ore bodies described above.

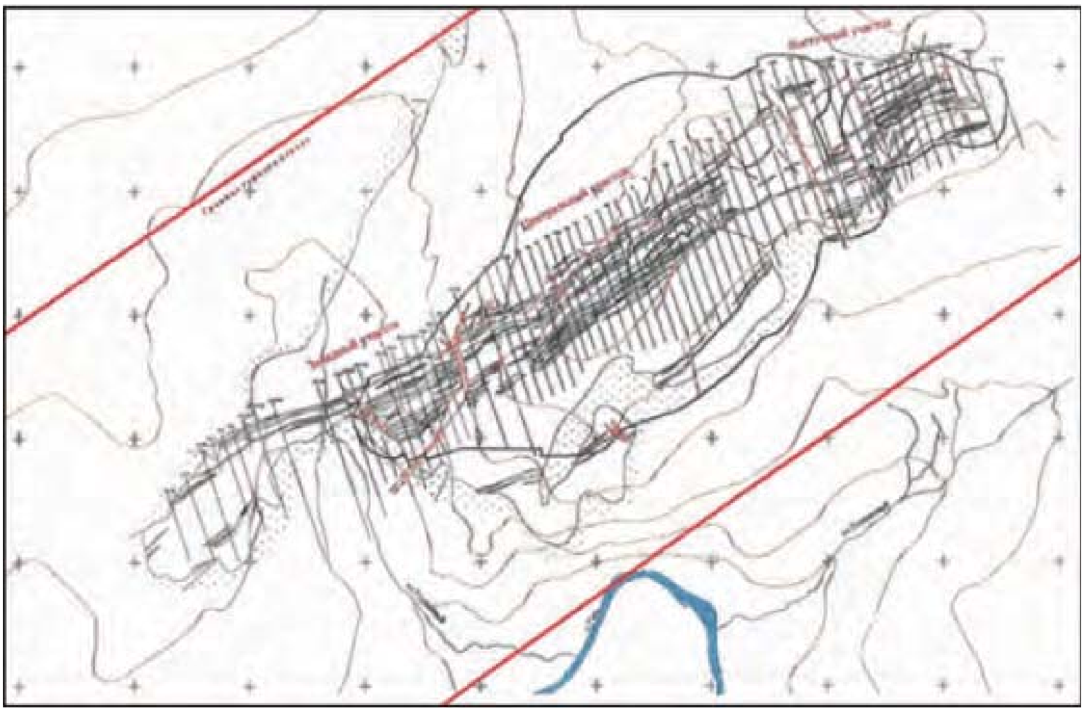

Figure 4.3: Plan of the Garinskoye Deposit

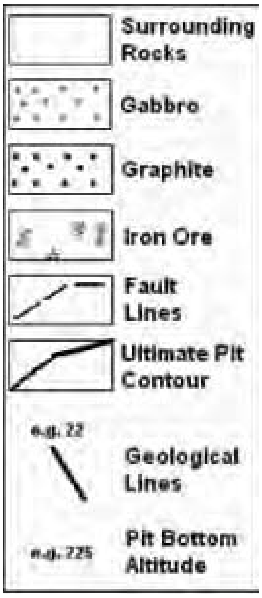

Figure 4.4: Key for Figure 4.3

The dominant form of mineralisation is magnetite that sees a shift to martite within the oxidation zone. Sulphide mineralisation also found in the deposit includes pyrite, chalcopyrite, blende, galena, chalcocite, pyrrhotite, molybdenite, bornite and covellite. From the non-metals amphibole, albite, garnet and calcite dominate.

The magnetite ores can be divided into three iron grade types: rich (high) grade (>50% Fe), average (medium) grade (from 20 to 50% Fe) and poor or low grade (from 15 to 20% Fe).

The high grade ores are divided into low phosphorus (P_2O_5 <0.15%), phosphorus (P_2O_5 0.15 – 0.5%), and highly phosphorus (P_2O_5 0.5 – 6%). The high grade ores and medium grade ores often interstratify and replace each other along strike and down dip. The high grade ores largely occur at the south-western part of the Central Zone at the extension of the upper ore horizon.

Chemical tests have shown that the ores contain up to 1.6g/t Au, 0.77% Cu, 0.01% Mo (in quartz veins up to 0.72% Mo), 0.01% Co, 0.02% Ni, 1.16% Mn, 0.01% V_2O_5.

4.4 Exploration, Drilling, Sampling and Data Verification

4.4.1 Historical Exploration Works

The deposit was first discovered by the Russian State in 1949 as a consequence of the verification of an aeromagnetic anomaly. In 1950-58, detailed exploration was carried out by the Russian State including pits, trenches, shafts and underground development, together with drill holes.

Exploration works completed from 1950-58 included:

- Pits and trenches — 63,445m^3;
- Shafts and insets — 5,224 linear m;

- Underground excavations — 1,655m; and
- Core drilling — 88,952m.

The exploration results showed that the deposit was made up of a complex of interbedded shales, magnetite ores and limestone that would indicate skarn mineralisation, especially as the ore zone has been subjected to contact metamorphism at the boundaries.

4.4.2 Recent Exploration Works

In 2007 IRC completed a confirmation drilling programme at Garinskoye which included the following:

- Core drilling — 8,411.9m;
- Trench samples — 3,574.2m^3;
- Metallurgical tests — four tests each of 1,000kg of low phosphorus, phosphorus, medium grade (Fe_{total} — 42%), low grade off-balance (Fe_{total} — 18.6%) ores; and
- Sample testing — 13,000kg of core and trench samples were sent to the Central Petropavlovsk Laboratory in Blagoveshchensk.

Investigation of the historic exploration data by Petropavlovsk geologists has determined that selective mining of 'direct ship' ore (at a grade >59% Fe), which occurs close to the surface, may be possible in the first years of mine development. A priority of the confirmation drilling programme, currently underway at Garinskoye, will be to delineate these pods of 'direct ship' ore for early mining

4.4.3 Sample Preparation, Analyses, Security and Data Verification

No data pertaining specifically to the sample preparation, analytical methods and QA/QC protocols for the historical data have been made available to WAI for the Garinskoye deposit. As of June 2010, WAI has reviewed the sample preparation and QA/QC protocols for the recent drill programme and are satisfied that they have been adequately undertaken.

Historically, the procedures implemented would have adhered to the guidelines outlined by GKZ. Sample collection and analytical procedures would be those required by GKZ, and a thorough audit of QA/QC procedures prior to classification will have taken place of a standard equivalent to or greater than that required by the JORC Code (2004).

Sample analysis is being undertaken at the Central Petropavlovsk Laboratory in Blagoveshchensk which is also carrying out the analytical testwork for Kimkan and Sutara in parallel.

> ***WAI Comment:*** *WAI carried out a site visit to the sample preparation and assay laboratories of Central Petropavlovsk in Blagoveshchensk in 2007 and were impressed by the efficiency, general housekeeping and standards adopted within the facilities. The Central Petropavlovsk Laboratory is accredited in Russia (SAAL) and complies with international standards (ISO 17025). As a result, WAI is of the opinion that a high level of confidence can be placed on the assay data provided by IRC.*

Based on the details provided regarding the analytical methods and QA/QC procedures being used by IRC, WAI believes that for Garinskoye the procedures follow the GKZ protocols in line with those at Kimkan and Sutara and are to international best practice.

4.5 Mineral Resources

4.5.1 Garinskoye Historical Resources

As a result of exploration work undertaken between 1950 and 1954, GKZ classified Garinskoye as a Type III, or 3rd Group, deposit (defined by GKZ as "*complex, with uneven distribution of minerals*") and approved the reserves and resources under the Russian System. Details of these Russian System calculations have previously been published by the IRC Group.

Results of aeromagnetic test work conducted from 1982 to 1984, indicated 67Mt of prognostic iron ore resources on the eastern limb and the southern extension of the Garinskaya syncline. In 2009, approximately 8km to the north, a new anomaly was detected by IRC showing prognostic resources of approximately 190Mt and 8-10km to the south the Ust-Garinskaya ore zone has been revealed with prognostic resources according to different authors from 80 to 400Mt. In total, through additional exploration of the limbs and deeper horizons of the deposit, in WAI's opinion, the reserves of the Garinskoye deposit may be potentially increased by 500 – 600Mt.

Within the Selemjinsky iron ore region there are 4 more ore zones: Selemjinsky, Glubokinsky, Aldikonsky and Shimanovsky.

4.5.2 Garinskoye Micromine® Block Model

4.5.2.1 Introduction

Resource modelling was undertaken in 2008 by RJC Consulting on behalf of IRC. The scope of works was to produce a resource model and a subsequent pit optimisation exercise using Micromine® software. Data was provided by IRC and included:

- Photocopies of the report "On geological exploration that was conducted in Garinskoye iron ore deposit in 1950-1955 with estimation of Ore Reserves as of 1st January 1956", comprising 30 volumes;
- Digital database containing boreholes, sampling and mine workings; and
- Digital model of topography.

WAI Comment: WAI is satisfied that the mineralised envelopes defining medium and high grade mineralisation have been generated in an appropriate manner.

4.5.2.2 WAI Review of the Garinskoye Mineral Resources

WAI has undertaken a review of the resource estimation methodology and resultant resource model for the Garinskoye deposit. The following data was provided for the review by RJC:

- Block Model in CSV format;
- Mineralisation and waste lens wireframes; and

- Drill hole and trench assay, collars, and survey data in CSV format.

WAI is satisfied that the mineralised envelopes defining medium and high grade mineralisation have been generated in an appropriate manner. WAI does, however, have some concerns regarding the final grade estimation. The estimation was carried out by RJC using IPD[2]. There appears to have been no use of variography to review and assess the spatial variability of sample grades, nor has an alternative estimation method been used for comparison. Whilst WAI is of the opinion that the grade estimation has scope for improvement, WAI believes that improving the estimation methodology will not significantly change the final quoted Mineral Resource tonnage and grades.

The Mineral Resources classified by WAI in accordance with the guidelines of the JORC Code (2004) are given in Table 4.2 below:

Table 4.2: Garinskoye Mineral Resources*
In accordance with the guidelines of the JORC Code (2004) — 20% Fe_{Total} C.O.G.

Resource Classification	Mineral Resources (Mt)	Fe_{Total} (%)	Fe_{Total} (Mt)
Indicated	219.9	32.03	70.4
*Inferred**	156.0	29.29	45.7

* Mineral Resources are presented as at the date of this CPR.

* For a description of the categories of *Measured*, *Indicated* and *Inferred* JORC-Compliant Mineral Resources, and the level of confidence attributable to each category, please refer to the section headed "Classification of Geological Resources and Reserves — Reporting of Mineral Resources in accordance with the JORC Code (2004)" in this report.

4.6 Ore Reserves

Ore Reserve estimation and open pit optimisation/design of the Garinskoye deposit was carried out in 2008 by RJC Consulting based upon their Micromine® resource model.

4.6.1 Optimisation Parameters

For the purpose of the Ore Reserve estimation a mining recovery of 96% with a dilution of 7% was applied with a grade of 20% Fe_{total} given to the waste material.

WAI are satisfied that the Ore Reserve estimation methodology and parameters applied by RJC to the Garinskoye Mineral Resources were appropriate and well executed. The parameters used in the optimisation of the Garinskoye pit, which WAI consider to remain valid as of the date of this reports are shown in Table 4.3.

Table 4.3: Garinskoye Economic Pit Optimisation Parameters

Parameter	Value	Conversion into US$/t of Ore
Selling Price of End Product	US$80/t for concentrate at the Chinese border	32.31
Transport of Concentrate from Garinskoye to Kimkan-Sutara	US$8.52/t of Concentrate	4.35
Transport of End Product to User	US$6.80/t of commodity concentrate	3.05
Royalties (US$/t)	US$1.66/t of commodity concentrate	0.67
Cost of Ore Processing at Garinskoye (US$/t)	US$1.18/t of ore	1.18
Cost of Ore Processing at the Concentrating Plant (US$/t)	US$2.66/t of ore	2.66
General and Administration (Garinskoye and Kimkan-Sutara) (US$/t)	US$2.04/t of ore	2.04
Cost of Mining	Overburden-US$2.44/$m^3$ Ore-US$0.90/t	
Cost Adjustment for every 100m depth	US$0.10/t for every 100m of sinking	

WAI Comment: The commodity price used in the open pit optimisation is the long term forecast price taken from the KSG Feasibility Study (2008). This commodity price does not take into account any relative price advantage that the Company may enjoy due to the Company's expected relatively low cost of transporting concentrate to the PRC from Garinskoye as compared to seaborne iron ore. WAI considers this long term price to be a reasonable price for use in reserve calculations based on the historical long term iron ore price.

4.6.2 Geotechnical

A pit slope and bench stability analysis was conducted for this project as part of the KSG Feasibility Study (2008). Based on the results, the design parameters of the pit slopes and benches were selected to ensure the stability of the pit. The calculations were carried out using the computer software programme "USTO", which is approved by Gosgortekhnadzor (the State Committee for Supervision of Industrial Safety and for Mining Inspection).

Giproruda has undertaken stability analyses of pit slopes and benches. These results were used to determine the pit design parameters in this report. The design parameters for slopes and benches are given in Table 4.4 below.

Table 4.4: Garinskoye Open Pit Design Parameters

		Slopes Parameters		Bench Parameters	
Face	**Rock Type**	**Face Height (m)**	**Slope Angle**	**Bench Height (m)**	**Bench Slope Angle**
Southeast Face	Weathered zone			15	45°
	Competent rock	490	41°	30	Upper benches: 60°, Lower benches (down to 40m): 70°
North Western Face	Weathered Zone			15	45°
	Competent Rocks	510	42°	30	Upper Benches: 65° Lower (based on 110m): 70°
Northeast Face	Weathered Zone			15	45°
	Competent Rocks	200	No data	30	Upper — benches: 60° Lower (based on 230m): 70°

The width of the safety berm at the base of the transition zone from oxidised to primary ore will be 12m. In areas where the slope angles are 60° and 65°, the width of safety berm will be 10m and for slope angles of 70°, the berm width will be 11m. The final pit dimensions outlined at surface extend some of 3.4km by 1.3km and at depth an extent of 700m by 80m, the pit will extend from the 280m RL down to the 500m RL with benches of 10m height.

The following measures were taken into consideration for the stabilisation of slopes and faces:

- Designing of pit parameters to ensure pit stability;
- The application of specialised blasting techniques when blasting near the final pit limits (i.e. pre-splitting, trim blasting and vibration control); and
- The implementation of regular geological and surveying inspections to monitor the stability of the slopes.

> ***WAI Comment:*** *The information provided above has shown that Giproruda has gone into detail in researching and analysing the most appropriate slope angles for the final pit walls. They have clearly indicated the parameters at various locations and depths in the Garinskoye pit and WAI consider these design parameters to be technically sound.*

4.6.3 Summary of Ore Reserves

RJC produced an economic open pit reserve based on their Mineral Resource model, which was classified under the Russian System for resource classification. Details of these Russian System calculations have previously been published by the IRC Group.

WAI considers that RJC applied appropriate technical and economic parameters to the Mineral Resource when estimating the open pit reserves. In order to confirm that this ore reserve statement is equivalent to a Ore Reserve in accordance with the guidelines of the JORC Code (2004), WAI has run a reserve optimisation using the RJC parameters and the Mineral Resource Model from 2008 in accordance with the guidelines of the JORC Code (2004). This demonstrates that the Mineral Resources contained within the designed open pit are economical and therefore, are *Probable* Ore Reserves under the guidelines of the JORC Code (2004). A summary of the Garinskoye optimisation results is given in Table 4.5 below.

Table 4.5: Garinskoye Ore Reserves
In accordance with the guidelines of the JORC Code (2004)

Ore Reserve *(Mt)*	Fe_{Total} *(%)*	Fe_{Total} *(Mt)*	Waste *(Mt)*
211.7	36.00	76.2	911.6

Note: Ore Reserves are presented as of 01 November 2008. As no ore extraction took place and no resource/reserve update has been performed since that date, the above statement remains valid as at the date of this CPR. C.O.G. of 20% Fe_{Total} was applied. No ore dilution and mining losses have been applied to the above tonnages. It is WAI's opinion that the above Ore Reserves are *Probable* Ore Reserves under the JORC Code (2004).

WAI considers that the underlying assumptions of the KSG Feasibility Study (2008), upon which the open pit was designed, remain valid and that the reserve figures remain up to date.

4.7 Mining

4.7.1 Mine Design

The mine design outlined below is based upon the RJC (2008) Ore Reserves as described in Section 4.6, above.

The final pit dimensions will be 3.4km by 1.3km at the surface and 700m by 80m at the bottom of the pit. The pit will commence at RL 280 and mine down to a total depth of 500m at RL-220. All working benches will be 10m in height. Haul roads are 34.3m wide and will be developed at a 10% gradient. The design is shown in Figure 4.5.

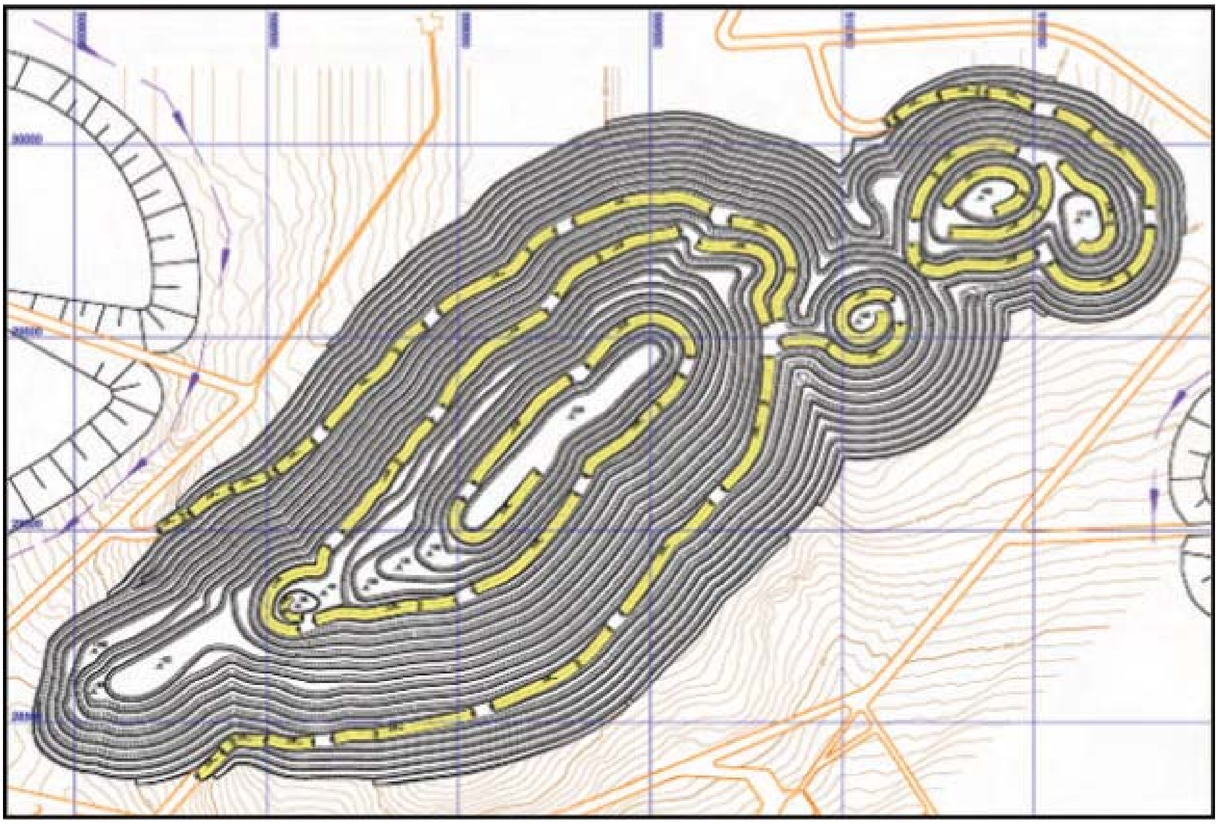

Figure 4.5: Mine Design of Garinskoye Pit

WAI Comment: WAI considers the input parameters to be technically sound.

4.7.2 Mining Method

The nature of the deposit and the topography of the site is ideally suited for conventional open pit truck and shovel mining methods. The following mining equipment is planned to be used:

- Electric hydraulic face shovels with a bucket capacity up to $15m^3$;
- 130t capacity rear dump trucks;
- Electric drills for 200mm diameter blastholes;

- Large bulldozers for loading assistance and dump management; and
- Other specialist ancillary equipment.

WAI Comment: WAI considers the mining method to be sound.

4.7.3 Mine Development

Prior to the commencement of any mining operations at Garinskoye an access haul road, approximately 60km in length, is required to join with the Federal road from Svobodny to Fevralsk. In the longer term, an approximately 120km rail connection is required to join the project site to the Trans-Siberian mainline at the nearest existing station of Shimanovsk. The rail connection will have to cross the Garinskoye River.

WAI Comment: Substantial development is required and needs to be in place prior to mine development.

4.7.4 Mine Production Schedule

The mine production schedule has been based on the following basic data:

- The operational reserves of ore, the volumes of rock mass, overburden and their distribution by bench;
- The general productivity of the pit in accordance with the design;
- The system of mining accepted and its parameters; and
- Basic mining equipment and its productivity.

The mine will commence operations with a production rate of 2Mtpa in 2014, ramping up to 10Mtpa of ore in 2016.

In Year 5, the mine will be in full production and the planned total volume of rock mass mined will be 28.8Mm^3, which will include 26.1Mm^3 of overburden and 10Mt of ore.

The mining schedule for the development and production of ore and waste along with the coefficient of overburden are given in Table 4.6.

WAI Comment: The mining schedule has been provided in an easily understandable format and WAI believe the mining schedule to achievable.

Table 4.6: Proposed Mining Schedule

Designation	Unit	Total	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
			Years of Mining																						
Ore (Dry)	Mt	**213.3**	**1.9**	**7.8**	**9.7**	**9.7**	**9.7**	**9.7**	**9.7**	**9.7**	**9.7**	**9.7**	**9.7**	**9.7**	**9.7**	**9.7**	**9.7**	**9.7**	**9.7**	**9.7**	**9.7**	**9.7**	**9.7**	**9.7**	**9.7**
Grade (Fe)	%	**39.3**	39.99	39.57	39.79	39.97	40.96	40.92	40.50	39.85	39.71	40.02	39.32	38.13	37.52	38.49	39.00	38.77	38.92	38.71	38.57	39.08	39.02	38.55	37.96
Iron—Metal	Mt	**83.7**	0.77	3.07	3.85	3.87	3.97	3.96	3.92	3.86	3.85	3.88	3.81	3.69	3.64	3.73	3.78	3.76	3.77	3.75	3.74	3.79	3.78	3.36	2.57
Ore—Volume	Mm^3	**56.1**	0.51	2.04	2.55	2.55	2.55	2.55	2.55	2.55	2.55	2.55	2.55	2.55	2.55	2.55	2.55	2.55	2.55	2.55	2.55	2.55	2.55	2.29	1.78
Ore (Wet)	Mt	**220.2**	**2.0**	**8.0**	**10.0**	**10.0**	**10.0**	**10.0**	**10.0**	**10.0**	**10.0**	**10.0**	**10.0**	**10.0**	**10.0**	**10.0**	**10.0**	**10.0**	**10.0**	**10.0**	**10.0**	**10.0**	**10.0**	**10.0**	**10.0**
Grade (Fe)	%	**37.9**	38.61	38.21	38.42	38.60	39.56	39.51	39.11	38.48	38.34	38.64	37.97	36.82	36.23	37.17	37.66	37.43	37.58	37.38	37.25	37.74	37.68	37.22	36.65
Iron—Metal	Mt	**83.5**	0.77	3.06	3.84	3.86	3.96	3.95	3.91	3.85	3.83	3.86	3.80	3.68	3.62	3.72	3.77	3.74	3.76	3.74	3.72	3.77	3.77	3.35	2.57
Ore—Volume	Mm^3	**59.0**	0.54	2.14	2.68	2.68	2.68	2.68	2.68	2.68	2.68	2.68	2.68	2.68	2.68	2.68	2.68	2.68	2.68	2.68	2.68	2.68	2.68	2.41	1.88
Total Rock Volume	Mm^3	**484.8**	**2.1**	**11.3**	**17.7**	**18.6**	**28.8**	**28.9**	**29.4**	**30.0**	**29.6**	**29.9**	**29.9**	**29.2**	**28.8**	**23.5**	**22.2**	**21.6**	**20.2**	**17.5**	**15.3**	**14.5**	**12.6**	**11.3**	**7.7**
Overburden, comprising:	Mm^3	**425.7**	**1.6**	**9.2**	**15.0**	**16.0**	**26.1**	**26.2**	**26.7**	**27.4**	**26.9**	**27.2**	**27.2**	**26.5**	**26.1**	**20.9**	**19.5**	**18.9**	**17.5**	**14.8**	**12.6**	**11.8**	**9.9**	**8.8**	**5.8**
Off balance Ore	Mm^3	**28.0**	0.26	0.69	1.23	1.23	1.26	0.99	1.17	1.40	1.17	1.35	1.31	1.44	1.61	1.36	1.13	1.17	1.23	1.38	1.22	1.15	1.41	1.37	0.98
	Mt	**89.1**	0.83	2.21	3.92	3.92	4.00	3.16	3.73	4.47	3.71	4.31	4.17	4.59	5.12	4.31	3.58	3.72	3.91	4.38	3.86	3.67	4.49	4.34	3.10
Grade (Fe)	%	**21.13**	21.84	21.54	21.48	21.29	21.15	20.96	21.46	21.65	21.02	21.25	21.36	21.05	20.71	20.64	20.96	21.12	20.90	21.27	20.84	21.18	21.03	21.07	20.86
Waste	Mm^3	**397.8**	1.34	8.48	13.80	14.73	24.84	25.21	25.57	25.96	25.78	25.82	25.93	25.05	24.47	19.50	18.37	17.73	16.26	13.43	11.43	10.67	8.47	7.47	4.85
Coefficient of the overburden	m^3/t	**1.93**	**0.80**	**1.15**	**1.50**	**1.60**	**2.61**	**2.62**	**2.67**	**2.74**	**2.69**	**2.72**	**2.72**	**2.65**	**2.61**	**2.09**	**1.95**	**1.89**	**1.75**	**1.48**	**1.26**	**1.18**	**0.99**	**0.98**	**0.83**
Stripping Ratio	t/t	**5.41**	**2.24**	**3.22**	**4.20**	**4.48**	**7.31**	**7.34**	**7.48**	**7.67**	**7.53**	**7.62**	**7.62**	**7.42**	**7.31**	**5.85**	**5.46**	**5.29**	**4.90**	**4.14**	**3.53**	**3.30**	**2.77**	**2.74**	**2.32**
Concentrate Produced	Mt	**101.9**	**0.0**	**4.6**	**4.6**	**4.6**	**4.6**	**4.6**	**4.6**	**4.6**	**4.6**	**4.6**	**4.6**	**4.6**	**4.6**	**4.6**	**4.6**	**4.6**	**4.6**	**4.6**	**4.6**	**4.6**	**4.6**	**4.6**	**4.6**

4.7.5 Mining Fleet

The mining fleet requirements have been listed in Table 4.7 indicating the fleet size during Year 5, maximum quantity and replacements required.

Ancillary vehicle activities in the pit are:

- Cleaning of benches, berms, storage and dumps;
- Dust suppression in the pit, access and haul roads;
- Clearing of snowdrifts; and
- Road repair.

Table 4.7: Garinskoye Mining Fleet Requirements

	Quantity at Year 5	Max. Quantity	No. of Replacements
Loaders	10	10	4
Drills	6	6	6
Bulldozers	16	17	13
Trucks	47	49	62
Ancillary Equipment	17		

WAI Comment: *The mining fleet indicated above is considered to be fit for purpose.*

4.7.6 Mining Operations

Mining will be conducted by conventional open pit methods and the broken rock will be hauled to external ore stockpiles or waste dumps that will be located in close proximity to the pit.

Figure 4.6 illustrates the expected position of mining operations in the pit for Year 5.

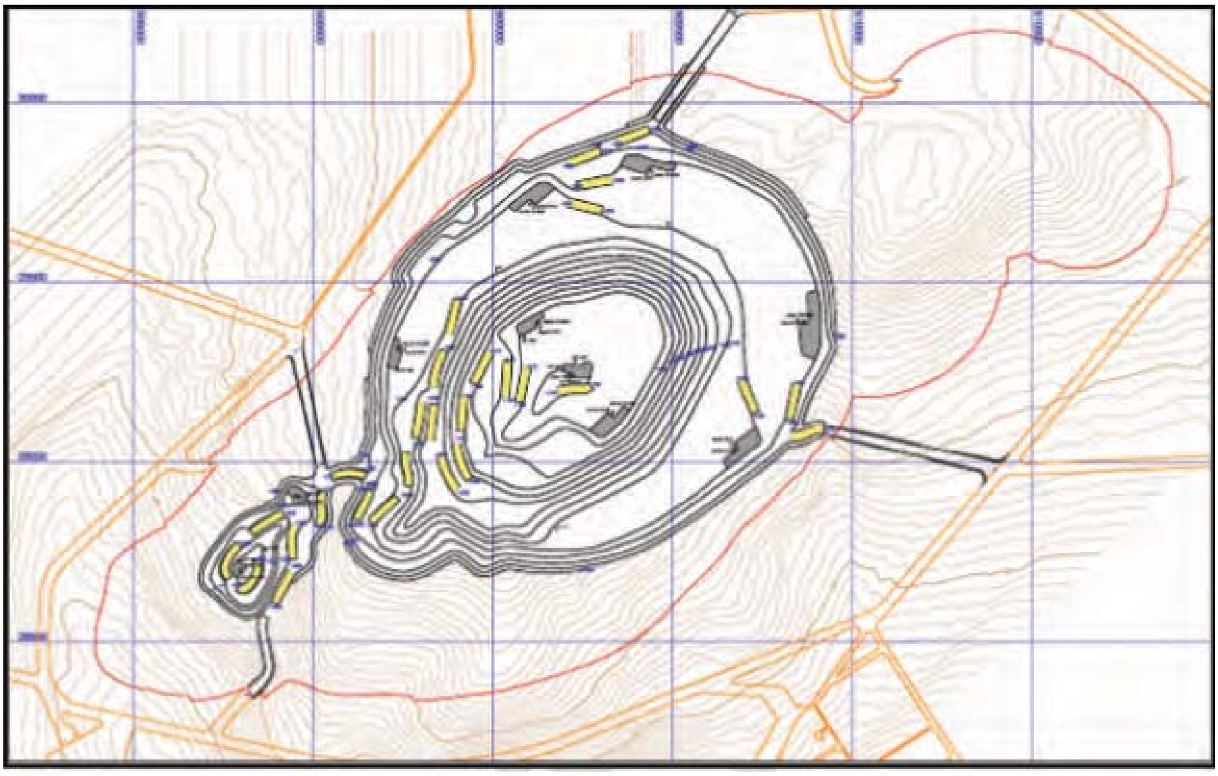

Figure 4.6: Expected Position of Mining at Garinskoye in Year 5

4.7.7 Drilling, Blasting and Secondary Breaking

The primary method of breaking both ore and waste will be drilling and blasting. The production drilling of ore and waste will be undertaken by Atlas Copco DML-EHP electric hydraulic, rotary drilling machines. This rig is capable of drilling up to 18.3m single pass and blasthole diameters up to 203mm.

The blasting pattern in waste will be 5.5m burden x 5.5m spacing with the hole depth of 12.2m, including 2.1m subdrill. In ore, the blasting pattern will be 4.8m burden x 4.8m spacing with the same hole depth as in waste.

The total production drilling per year will be 1.02Mm with approximately 40% of the total in ore. The yield per metre of blasthole will be 18.8m^3 in ore and 20.7m^3 in waste.

Secondary breaking of oversized rocks greater than 1.8m in size will be undertaken using a hydraulic hammer mounted on a CAT 330 excavator.

The capacity of active mine explosive storage (120t), takes into account the quantity of deliveries by rail, the amount of reserve required, and the needs for the construction of an explosives compound.

The construction of mine explosive storage compound will include:

- Two high explosives magazines depositories each of 55t capacity;

- Two detonator magazines (one of which will be used for the storage of SINV — non-electric detonators);
- A preparation area with laboratory;
- A guardhouse;
- A facility for storing fire fighting equipment; and
- Fire prevention reservoirs.

The explosive storage facility will be located 0.5km to the north of the open pit between the waste dumps 1 and 2, taking into account the explosion hazard zone. In accordance with the *"Single Safety Regulations during Blasting Operations",* the explosion hazard zone will be 700m in radius from non-bunkered storage and 350m from bunkered storage. A testing and destruction area will be constructed near the storage compound.

Delivery of explosives to the storage facility will be by truck from the unloading area at Shimanovsk station. Transportation to site will be by special trucks, which will be equipped according to Russian standard *"PB13-78-94 — Safety Regulations for Explosive Transport by Truck"*.

Delivery of the emulsion phase to the mine will be by road in purpose-built tankers. The explosives delivery, manufacture and shotfiring activities will be performed by a sub-contractor (Maxam Russia).

> ***WAI Comment:*** *WAI considers that the quantities of explosives and the product types mentioned above are technically sound. For a mine that is expected to produce a peak rate of 10Mtpa of ore, blasting only once per week will necessitate massive blasts in order to meet the required production rate. WAI believes it would be better to blast smaller shots more frequently. IRC has confirmed that this recommendation will be implemented.*

4.7.8 Ore Handling

The primary crushing facility is to be located on the south of the pit adjacent to the processing plant. The haul trucks will tip into two 250m^3 hoppers which will feed into two Sandvik 1651H feeders and then into two Sandvik CJ613 jaw crushers. The crushed ore will be transported first by a 121km conveyor belt to Shimanovsk City and then by rail to the Kimkan processing plant. A 10,000t ROM stockpile is available if required. It is important to note that the Russian Investment Fund may fund a rail connection between Garinskoye and Shimanovsk City which would then allow connection to rail lines to Kimkan. If this is approved there will be no need for the conveyor belt to be constructed by IRC.

4.7.9 Waste Storage

The waste excavated from the pit will be stored in dumps located on the edge of the pit. The total volume of the waste stored in the external dumps will be approximately 425.8Mm^3 including 4.3Mm^3 of oxidised material and 421.5Mm^3 of primary material. Taking into consideration the swell factors of 1.07 for oxidised and 1.3 for primary waste, the total required capacity of dumps will be 552.5Mm^3. In addition to this, there will be a dump with the capacity of 33.6Mm^3 for dry magnetic separation material.

Dump 1 (with capacity 370.0Mm^3) will be located on the western edge of pit at an elevation of 340m. Dump 2 (capacity 182.5Mm^3) is to be located on the north-eastern edge of pit, at an elevation of 365m.

The placement of waste on the dumps will be performed by bulldozers, so that the haul trucks can be kept at least 1.5m away from the edge of the dump whilst unloading.

During the development of the waste dumps, it will be necessary to carry out a visual check and make surveyed measurements to monitor stability.

4.7.10 Final Wall Stability

In order to ensure the safety of the pit slopes for the duration of the mine life, the following measures are necessary to reduce blast vibration:

- The application of multiple short delay trim blasts near the pit walls;
- Specialised presplit blasting to create the final pit wall using bore holes of small diameter (130 mm); and
- The periodic cleaning of bench crests and protective berms.

The mine geologists and mine surveyors will take measurements to monitor and predict the potential for slope failures in the pit and dump walls. Observations of deformation of these walls must be conducted in accordance with the requirements laid out in the Russian document *"Instructions for the Observation of Deformation of Boards, Slopes, Ledges and Dumps in Quarries, and the Development of Measures to Ensure Stability"*, affirmed by Gosgortekhnadzor (State Committee of the Council of Ministers for Supervision of Industrial Safety and for Mining Inspection (RSFSR)).

4.7.11 Dewatering

The inflow of water into the pit is caused by ground water and precipitation. To prevent water running off the hills into the pit, drainage channels will be constructed around the perimeter of the pit.

The maximum water-inflows in summer due to rain and groundwater beside the pit are expected to be:

- Underground waters — 300m^3/h; and
- Atmospheric precipitations — 1090m^3/h.

During the early stages of mining Flygt Bibo piston pumps will be used to deal with the mine water *via* collection sumps. In the latter production years, the volume of incoming water will be handled by drilling strategically placed, water reducing bore holes.

4.7.12 Dust Suppression

Dust suppression activities will be performed by two water trucks that will be operating on the same roster as mining operations.

> ***WAI Comment:*** *The mining operations mentioned above are considered to be technically sound for the size of operation.*

4.7.13 Surface Layout & Infrastructure

The main components of the site are listed below:

- Open pit mine;
- Waste dumps;
- Disposal area for dry magnetic separation;
- Crushing and screening plant;
- Industrial area of the mining and processing complex;
- The drainage and purification system for pit run-off and storm sewerage with accumulator-sinker;
- Intake for ground water;
- Explosives magazines and storage complex;
- Accommodation camp;
- A 220/110/35/6kV substation (Garinskoye);
- 2 x 110/6kV substations (RP6kV);
- Recycling and storing area for industrial and domestic waste; and
- Helicopter pad.

The industrial area is located to the south of the open pit and extends for 1 km to the south-east. The industrial area includes the following main facilities:

- Secondary crushing and screening plant with dry magnetic separation;
- Fuels and lubricants store;
- Boiler house;
- Coal store;
- Motor depot;
- Maintenance and supply base;
- Administrative and accommodation facilities; and
- Sewerage treatment facilities.

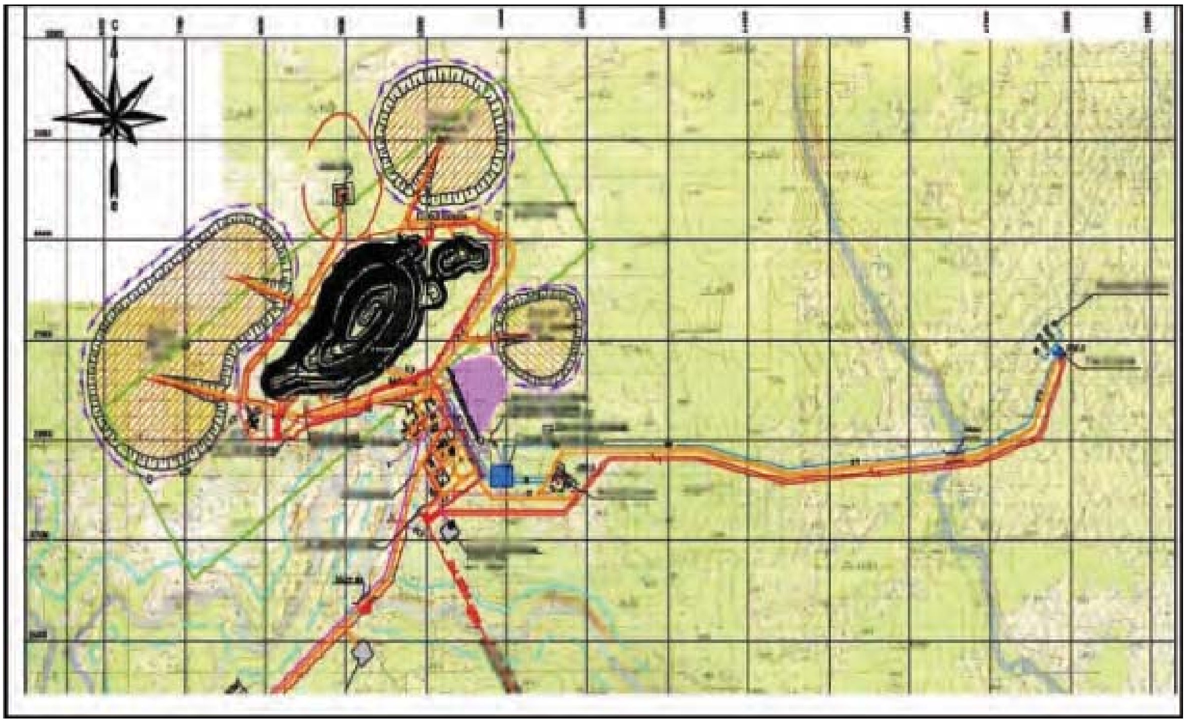

Figure 4.7: Garinskoye Site Layout

4.7.14 Power Supply

The power supply for the site is provided by overhead power lines from the Federal Network (Novokievka-Fevralsk) near Mayskiy, with a 220kV line to the 220/110/6kV substation on site (located 0.5km to the east from the industrial area). The substation will lower the voltage to the levels required on site.

4.7.15 Water Supply & Management

Potable and industrial water for the industrial area, processing complex and accommodation camp will be supplied from underground bores from the Lebedevskij Stream valley (a feeder of the Orlovka River). Water will be pumped from a facility located 7km to the east of the industrial area, and the length of the water pipelines and the access highway to the water pipeline is 8km. Industrial water is also provided from reverse water supply from the plant and the treated pit run-off and storm waters.

The water supply system consists of:

- 4 water wells (3 working, 1 reserve);
- Pumping stations;
- Water preparation station with clean water tank and filter-absorbents; and
- System of surface water removal.

The KSG Feasibility Study (2008) specifies three types of waste water: Utility-domestic sewerage; water from pit dewatering and run-off; and utility-domestic water from the camp, the industrial area and the boiler room. These will be treated in the Biodisk-1000 treatment facility.

The run-off water from the production area and from dumps and pit-water will also be cleaned prior to being reused or discharged. The cleaning technology is based on reducing contaminants to levels that will allow the water to be used in fish reservoirs. The treatment includes fast filters loaded with activated carbon.

Once clean, a proportion of the water will be recycled into the main water supply system. The remaining volume of clean water and disinfected sewerage will be discharged into the Garinskoye River.

4.7.16 Heating

The source of heat for buildings and facilities of Garinskoye will be provided by a new boiler complex. The system is based on pumping boiling water *via* pipes around the plant and buildings to heat the rooms by convection. This method is the standard Russian approach to dealing with heating in areas with extreme winter temperatures.

4.7.17 Maintenance

The maintenance workshops and parts warehouse will be situated within the industrial area of the Garinskoye site in the zone near the pit. Scheduled maintenance and repairs will take place on mining, mineral processing, energy production and auxiliary equipment. The spares, consumables and equipment will be kept in this facility. It will also have an office for the organisation of maintenance, garage and supply bases.

The workshops will consist of three buildings. The first will be for repairs on pit plant (truck, shovels and drill rigs) when repairs cannot be performed in the field. The second building will be used for servicing (i.e. replacement of oil, brake blocks, cooling liquid and filters, fixing, tyre-fitting, control-adjusting and for minor repairs jobs such as welding).

The third building will provide repair and manufacturing facilities, restoration of products, aggregates supply, plus units and details for mining, concentrating, power, auxiliaries, pit plant and special equipment, as well as the engineering systems for buildings and structures. There will be plenty of space provided for parking of machines at shift and lunch breaks.

The stores warehouse will ensure that a suitable stock of spares and consumables is maintained to ensure that production is not interrupted.

4.7.18 Accommodation

The accommodation camp is located 1km to the east of the industrial area and 1.5-2.0km to the southeast of the open pit. The total number of the residents in the camp when fully developed will be 550 persons.

The accommodation camp will consist of 6 accommodation buildings (fully developed) of which 5 buildings are for workers, each housing 100 people, and 1 building for engineers and technicians capable of accommodating 70 people. The design of the buildings will take into account the expansion and enlargement of the camp during the process of development of the site.

The accommodation buildings are two-storey, wooden-framed, equipped with hot and cold running water, sewerage and heating facilities, power supply, and communication systems.

A public area will join all the basic zones of the accommodation camp. This area will include a hotel building for 50 people, a canteen for 150 people and administrative buildings consisting of supervisors' offices, shops, a library and drugstore. There will also be a sports complex.

4.7.19 Transport

IRC intends that the transport of crushed ore from Garinskoye to the processing plant at Kimkan will be carried out via the use of a 121km conveyor from Garinskoye to a rail terminal at Shimanovsk City (Shimanovsk-2) and then by rail onto Kimkan. However, if the State Investment Fund approves an application by IRC for construction of a rail connection to Garinskoye and constructs the railway at the expense of the Russian State, then the transport of ore will be solely by rail.

The movement of men and materials to and from the Garinskoye site will be achieved by road transport. A 120km access highway will be provided from Shimanovsk city to the site. Materials will be delivered by road or rail via Shimanovsk city to the proposed Shimanovsk-2 storage facility (8km west of Shimanovsk) and moved to the mine site by road. Table 4.8 below illustrates the proposed volumes of materials to be transported to site by road per annum.

Table 4.8: Proposed Volume of Incoming Materials by Road

Total Annual Volume of Materials, t	96,100
Including :	
—coal	15,500
—fuel and lubricants	34,000
—explosive materials	19,000
—goods in pieces and in the package	4,400

Transport around the site will also be by road. A network of roads, at least 7m wide, will be built to access all parts of the mine. The transport of operators to and from the various working locations will be provided by shift buses. Table 4.9 shows the fleet of support vehicles to be used on the site.

Table 4.9: Support Transport Requirements

	No. Required
Motor Depot	
Bus LIAZ-5256	5
Tank lorry MDK-5337	2
Truck URAL-4320	3
GAZ-2705 "Gazel"	2
ZIL-433362	2
UAZ-31519	1
Tractor-trailer K-701	1
Tow tractor BeLAZ-741131	1
Tractor-trailer MAZ-6303A8	2
Management	
UAZ-31519	3
Nissan Patrol	2
Road Repair Service	
Bulldozer T-15.01	3
Motor grader D3-98	2
Road roller DU-85	2
Dumper MAZ-5516A	5
Loader RK-33-02-00	1
Emergency Services	
Medical UAZ-3962-01	1
Fire-fighting vehicle URAL 8-6-40	2
Plant Engineering & Major Repairs	
KAMAZ-4314	1
Autocrane KS-55713	2
Warehousing	
Loader MOAZ	1
Energy Service	
Minibus ZIL-43362	1

The pre-concentrates will be transported off-site by an overland belt conveyor from the Garinskoye crushing and processing plant to the storage area at the proposed Shimanovsk-2 facility. 7.2Mt of Garinskoye pre-concentrate, which has undergone dry magnetic separation, will be transported from the site every year. The total capacity calculations are based upon the conveyor operating 5,420 hours per annum with approximately 1,850t moving along the belt every hour. Table 4.10 indicates the specification of the conveyor belt.

From there, the pre-concentrates will be loaded into railway vehicles. When a fully loaded train is formed, it is moved by diesel locomotive from the Shimanovsk-2 facility to the Shimanovsk city station and on to the Russian Railways network. Russian Railways electric locomotives are then used to transport the train to the wet magnetic separation plant located at the mining and processing complex at K&S.

Table 4.10: Conveyor Specifications

Length	124km
Total Capacity	10.0 Mtpa
Carrying capacity	1,200 t/hour
Annual productivity—pre-concentrate	7.2 Mtpa
Width of conveyor belt	800 mm
Total rated capacity, including:	17,400 kW
—the head-end station	2,600 kW
—the tailpiece	1,850 kW
—the intermediate power-drive stations (7 No.)	12,950 kW
No. of support pieces	18,750

WAI Comment: *WAI considers that 50 week/year is optimistic for the operation of a 124km long conveyor in the extreme climate conditions due to the maintenance requirements of such an system. Further options to bring the rail line closer to the mine should be considered to minimise the reliance on long conveyor systems.*

The conveyor study was carried out in 2009 by Metso Minerals. No rail or pipeline studies have been conducted.

4.7.20 Communications and Alarms

The following types of communication will be used on site: wire telephone communication; radio communication; and loud-speaker or tannoy communication. The following safety systems are also present on site:

- Automatic fire fighting system;
- Fire alarm system;
- Burglar alarm system; and
- CCTV system.

4.7.21 Manpower

The proposed working hours at the mine site are:

- 365 working days per year;
- 7 working days per week;
- 2 shifts per 24 hour period; and
- 12 hour shifts including a 1 hour lunch break.

A calculation has been made to generate the 'coefficient' of workers on the payroll on the basis of the current labour legislation, vacation time and of sick leave. The coefficient of workers on the payroll comprises:

- Administrative and management personnel working 5 day work week — 1;
- Auxiliary and engineering personnel working on shifts — 2; and
- Industrial production personnel working shifts — 2.38.

The total number of workers for the project will be 1,461 people. The shift roster means that only 715 people will be at work at any one time. The distribution of staff at the industrial sites and according to the work roster is given in Table 4.11 and Table 4.12.

Table 4.11: Distribution of Staff

Category	Head Office	Industrial Area	HO /Industrial Area	Shimanovskaya-2	Total
Top Management	1	1	1		3
Management	17	26	19	7	69
Engineering Specialists		27		6	33
Major Workers		395		99	494
Specialists		8	1		9
Auxiliary Workers		90	2	15	107
Total	**18**	**547**	**23**	**127**	**715**

Table 4.12: Distribution of Staff by Shift Roster

	Coefficient	Reported	Payroll
5-days work week	1.00	76	76
Shift	2.00	357	714
Shift	2.38	282	671
Total, people		**715**	**1,461**

WAI Comment: *WAI believes the number of personnel required to perform all the necessary tasks during the life of the mine to be accurate and suitable given the operating conditions and the region.*

4.7.22 Safety

The following standards and rules are used as the basis of safety rules and regulations on site:

1 Federal Law "About the Industrial Safety of Dangerous Production Units" from 21.07.97g. No116-FZ;

2 Federal Law "About the Bases of Industrial Safety Measures in the Russian Federation" from 17.07.1999g. No181-FZ;

3 Government of the Russian Federation from 10.03.1999g. No263 "About Organization and Realization Of Production Control Besides the Observance of the Requirements of Industrial Safety on the Dangerous Production Unit";

4 United Safety Regulations With The Development of the Layers of the Minerals in an Open Manner (PB-03-498-02);

5 Technical Operation Instruction of the Layers of Minerals with the Development in an Open Manner (1981god "Nedra");

6 The Uniform Rules of Safety with the Blasting (PB-13-407-01);

7 General sanitary rules (1.1. 1200-03 SanPiN);

8 Normal Technological Planning of the Mining Enterprises of Ferrous Metallurgy by the Open Method of Development. [Giproruda] (VNTP-13-186 — see the enumeration SK -1 of the RF State Committee on Questions of Architecture and Construction 2004).

All buildings and constructions on the industrial site must satisfy the requirements of the relative legislation: *"SNIP — Construction Norms and Regulations (2.04.01-85)"*; and *"Fire-Prevention Requirements, Basic Condition of Design"*.

The positioning of the facilities of the industrial area has been designed to take into account the terrain of the location and the production scheme. A fire department and militarised mine-rescue units will be present on the mine site.

> ***WAI Comment:*** *The information supplied in the safety section is comprehensive and appears to covers all aspects required for a mining and processing operation of this scale.*

4.7.24 Salaries

Salaries are differentiated into 15 groups. Calculation of salaries includes northern and regional coefficients and bonuses. With these increases the salary scale and distribution of salaries are shown in Table 4.13.

Table 4.13: Garinskoye Salary Scale

Level	Basic Rate (RUR)	Regional Coefficient	Northern Coefficient	Bonuses	Reported Number of Workers	Total Monthly Salary (RUR)
1	5,000	40%	50%	50%	28	14,250
2	6,250	40%	50%	50%	127	17,813
3	7,813	40%	50%	50%	74	22,266
4	9,766	40%	50%	50%	59	27,832
5	12,207	40%	50%	50%	200	34,790
6	14,038	40%	50%	50%	400	40,009
7	16,144	40%	50%	50%	458	46,010
8	18,565	40%	50%	50%	82	52,911
9	21,350	40%	50%	50%	11	60,848
10	24,553	40%	50%	50%	8	69,975
11	28,236	40%	50%	50%	4	80,471
12	35,295	40%	50%	50%	4	100,589
13	44,118	40%	50%	50%	3	125,737
14	55,148	40%	50%	50%	2	157,171
15	68,935	40%	50%	50%	1	196,464

Total labour costs, shown in Table 4.14, when operations are full capacity, are RUR534.6M (or US$21.3M) including:

- The unified social tax rate which is different for different levels of average annual wages,
- Compulsory accident insurance of 3.7% of each worker's salary;
- A shift bonus of RUR300 per day per shift worker;
- Transport expenses; and
- Clothing and footwear.

Table 4.14: Total Labour Costs (RUR)

Salaries Fund	456,376,852
Unified Social Tax	13,825,467
Accident Insurance	2,733,539
Shift Bonus	34,749,000
Transportation Costs	20,632,800
Inventory and Special Clothing	6,314,400
Total:	**534,632,058**

WAI Comment: *WAI has checked the rosters, the working hours and the distribution of the salaries and consider the labour costs to be complete and accurate. In WAI's experience, the wages and salaries at Garinskoye are in-line with other mining operations in this region of Russia.*

4.8 Mineral Processing and Metallurgical Testing

Much of the information relating to mineral processing at Garinskoye is discussed in Section 3.8 of this report, which considers the joint processing of ore from Kimkan, Sutara and Garinskoye, and as such has not been repeated in this section.

The KSG Feasibility Study (2008) proposed the development of a concentrator located at Kimkan to beneficiate iron ores from Garinskoye, Kimkan and Sutara. Garinskoye ore would be pre-concentrated at a rate of 10Mtpa at the mine site and then transported to Kimkan by conveyor and then on by rail. A concentrator was to be constructed at Kimkan to process:

- 7.26Mtpa pre-concentrate from Garinskoye; and
- 10Mtpa iron ore from Kimkan and Sutara.

WAI reviewed this study and requested Corus Consulting (CC) to review and comment upon the 'Process Plant' sections of the study. This review includes beneficiation of the ores to produce iron ore concentrates and the production of 'iron', both for sale in the north-east region of the PRC or Russia.

IRC now intends to implement the K&S and Garinskoye projects in three stages:

Stage 1 — the development only of the Kimkan deposit and the construction of a process plant with a capacity of 10Mtpa of the ore by 2013. This plant will produce 3.22Mtpa of iron ore concentrate with the average grade of not less than 65% Fe. The capital investment for Stage 1 is estimated to be US$400M. The total current estimated operating costs for Stage I at Kimkan are US$38.79/t of concentrate sold.

Stage 2 — the development of the Garinskoye deposit complete with a crushing and screening complex, with a capacity of 10Mtpa of ore by 2016, which will be constructed at the Garinskoye site. The crushing and screening complex will produce approximately 7.3Mtpa of preconcentrate at 47.8% Fe which will be transported by conveyor and rail to the processing plant at Kimkan for further beneficiation. This will require that the processing plant at Kimkan be expanded and additional infrastructure be built for processing of the Garinskoye pre-concentrate.

After expansion, the Kimkan processing plant will produce 8.3Mtpa of iron ore concentrate with a grade of not less than 65% Fe. The current estimated capital investment for Stage 2 is US$353M. The total operating costs for Stage 2 are US$44.18/t of concentrate delivered to the PRC border.

Stage 3 — the construction of a metallurgical complex consisting of 5 ITmk3® modules with a total capacity of 2.5Mtpa of DRI and consuming 3.75Mtpa of concentrate. This metallurgical plant would be constructed adjacent to the processing plant at Kimkan. The remaining product 4.55Mtpa of 65%Fe iron ore concentrate will be sold. At this stage of development, in 2023, mining will commence at the Sutara deposit. The current estimated capital investment for Stage 3 is estimated to be US$1,066M. The total operating costs of Stage 3 are US$280.02/t including DRI and concentrate production, and transportation to the PRC border.

The duration of each stage will depend upon the availability of financial investment resources. Additionally the development of the Garinskoye deposit will depend upon the completion of construction of the railway line between Shimanovsk and Garinskoye which will be financed by the Investment Fund of the Russian Federation or the construction, at IRC's cost, of a conveyor to transport the ore from Garinskoye to Shimanovsk.

4.9 Capital and Operating Costs

4.9.1 Forecast Operating Costs

The life of mine operating costs for the Garinskoye operations, estimated by IRC in the KSG Feasibility Study (2008) and updated in May 2010, are summarised in Table 4.15 below.

Table 4.15: Summary of Garinskoye Life of Mine Operating Costs

Cost	Unit	Total Cost	Cost/Unit US$/t	Cost/Tonne Ore US$/t
MINING				
Total Ore Mined	t	220,200,000		
Total Waste Mined	m^3	425,700,000		
Total Mining	***US$***	***1,276,000,000***	***5.80***	***5.80***
PRIMARY PROCESSING				
Total Primary Concentrate Produced	t	159,900,000		
Total Primary Processing	***US$***	***189,200,000***	***1.18***	***0.86***
PRIMARY CONCENTRATE TRANSPORT				
Total Primary Concentrate Transported	t	159,900,000		
Total Transport	***US$***	***1,781,476,372***	***11.14***	***8.09***
SECONDARY PROCESSING				
Total Fe Concentrate Produced	t	101,900,000		
Total Secondary Processing	***US$***	***963,000,000***	***9.45***	***4.37***
CONCENTRATE RAIL TRANSPORT				
Total Fe Concentrate Transported	t	101,900,000		
Total Rail	***US$***	***752,103,804***	***7.38***	***3.42***
G&A and ENVIRONMENTAL				
Total G&A and Environmental	***US$***	***135,000,000***		***0.61***
TOTAL OPERATING COSTS	**US$**	**5,096,839,925**		**23.15**

The operating costs in Table 4.15 are presented as a total cost over the life of the mine, per unit produced or transported, where appropriate, and as unit cost per tonne of ore mined for comparative purposes. Non-income taxes such as mineral extraction tax and property tax are excluded from the table but amount to a further US$162.4M or US$0.74 per tonne of ore mined.

The cash operating costs are also presented by category in Table 4.16 below.

Table 4.16: Garinskoye Cash Operating Costs by Category

Operating Cost Category	Total Cost US$(1)	Cost per tonne of Ore Mined US$/t	Cost per tonne of Concentrate Sold US$/t
Workforce employment	447,109,000	2.03	4.39
Consumables (including fuel oil)	1,789,413,000	8.13	17.56
Power, water and other services	173,850,000	0.79	1.71
Administration & Environmental protection and monitoring	135,000,000	0.61	1.32
Product marketing and transport(2)	2,533,022,000	11.50	24.86
Royalties and Contingency expenses(3)	162,400,000	0.74	1.59
Total Operating Costs	**5,259,202,936**	**23.89**	**51.60**

(1) This table has been populated using data provided by IRC in the May 2010 update of the project cost model.
(2) The Company believes that Product Marketing and Transport costs will be the same irrespective of whether the conveyor or rail transport option is used.
(3) The IRC Cost Model (May 2010) presents costs for these items but no further breakdown between them.

WAI Comment: *Mining of ore and waste rock and concentrate transport (both primary and final concentrate) account for the majority of the operating costs. Within the mining costs, fuel oil for the truck fleet and other consumables such as explosives and maintenance materials are the main areas of expenditure. While still significant, labour costs are relatively low when compared with major mining operations in the west. Overall, WAI is of the opinion that the Garinskoye operating cost forecasts have been prepared in a diligent manner and the majority of the costs are based on either direct quotations from suppliers (in the case of rail transport) or through IRC's existing operating experience within the Amur Region.*

4.9.2 Capital Expenditure Plan

The capital costs have been documented in the KSG Feasibility Study (2008) and are summarised in Table 4.17.

The pre-production capital costs are those incurred in the period prior to the mine reaching its design capacity. These include the on-site infrastructure and the Shimanovsk-2 storage facilities. It has been assumed for the purposes of these calculations that the railway will be constructed and, therefore, the conveyor will not be required.

Table 4.17: Garinskoye Pre-production Capital Costs

Facility	Cost US$M
ITEM	
Pit and workshop	46.91
Processing plant	68.61
Accommodation camp	13.14
Auxiliaries and service objects	55.13
Internal infrastructure	19.79
Land improvement and landscaping	1.55
Land preparation for construction	3.19
Temporary buildings and constructions	1.74
Exploration works	19.00
Expansion of Kinikan Processing facilities	124.00
TOTAL PRE-PRODUCTION CAPEX	353.00

WAI Comment: *The capital costs for this project have been thoroughly examined and are believed to be economically sound. All major equipment items are supported by vendor quotes and construction costs are calculated by people with recent experience of developing large projects in this region of Russia.*

4.10 Environmental and Social Issues

4.10.1 Introduction

WAI was retained by IRC to carry out a review of environmental and social issues associated with the development of the Garinskoye Deposit, to provide a preliminary evaluation of the project in that respect and to identify the main issues likely to affect valuation and viability.

The project is the continual appraisal and development of IRC's iron ore resource properties and associated infrastructure at Kimkan & Sutara, and Garinskoye. The individual sites are at varying stages of development, ranging from completion of exploration at Garinskoye to feasibility at Kimkan and Sutara.

Sources of material reviewed, consulted or examined during this study were:

- Typical plans and geological sections of the mines;
- Maps showing conceptual layout of mines and related infrastructure;
- Topographic maps at 1:50,000 scale;
- Reports and maps showing the results of analysis of sampling to establish environmental baseline criteria;
- Climate and meteorological data;
- Preliminary information available, compiled from existing federal environmental information sources;
- Interim and completed studies for OVOS and ESIA undertaken on behalf of IRC including:
  - 'The evaluation of environmental and social risks of the development of the Kimkan, Sutara iron-ore deposits' by "Ekopromsistemy" October 2008;
  - Preliminary evaluation of environmental and social risks of the development of the Garinskoye iron-ore deposits' by "Ekopromsistemy" September 2007; MS
- IFC Due diligence report with final environment and social action plan (revised 1 May 2007);
- PHME Garinskoye Scoping Document 3 May 2007;
- Sibgiproruda Geological and Economical Appraisal of Garinskoye Iron Deposit
- IFC/IRC Environmental and Social Action Plan, 2007; and
- WAI Environmental, Social and Health and Safety Audit of Properties at Kimkan and Sutara, Kuranakh, and Garinskoye in Far Eastern Russia, September 2008.

The methodology used by WAI in carrying out this study has been to:

- Review project information and seek further clarification of project description as necessary;
- Review the environmental/social studies previously undertaken;
- Review and comment on key environmental and social issues;
- Advise on recommendations to satisfy 'best practice environmental management; and
- Assess the adequacy of planned progressive rehabilitation and closure costs.

4.10.2 Review and Comment on Environmental/Social Studies

A feasibility study and an Environmental and Social Impact Assessment of developing the Garinskoye iron ore deposit was prepared by Ekoprom-sistemy LLC in 2008 to support the feasibility study document. It is understood that this document will be used to seek OVOS approval in due course. General regional data has been collected in respect of environmental and social conditions relating to the proposed operations and infrastructure. WAI has reviewed this document.

> ***WAI Comment:*** *WAI considers that the content of the report in the context of the current pre-design state of knowledge of project development is adequate for this purpose. In this respect it is taken as a report of a preliminary assessment based on limited baseline information and preliminary project design.*

In general, the preliminary Garinskoye environmental report does not meet the IFC Performance Standards or the Equator Principles (see section 2.10.2.3). WAI expects that more work will be required to incorporate all of the health, safety, environmental and community (HSEC) comments into a revised ESIA but considers that a completion of such an ESIA could follow Russian State approval of OVOS, OOS and the Technical Study. WAI understands that a completion date of December 2010 has been advanced. WAI believes that this could be achieved, however no further information on progress has been provided since May 2010. WAI has reviewed the document for HSEC components of a Preliminary ESIA and has provided detailed comment on the additional coverage required. The main findings are as follows:

- The ESIA document must be able to stand alone and all aspects of ESIA must be supported in the document and attachments. To meet IFC Performance Standards, the document will need to be formally disclosed;
- The introduction should summarise all major ESIA findings and include a list of the work completed by the various specialists on the project. It should have a statement in the introduction indicating that, when parts of the ESIA were not completed by Ecopromsistemy, that work has been assumed to be accurate;
- The IFC Performance Standards are correctly identified; however it is indicated that Performance Standards 5, 7 and 8 are not applicable to the ESIA but there is no supporting evidence provided for these statements;
- The baseline data section appears to be largely based on literature reviews and historical data which are generalised by nature. The report is largely reliant on the secondary sources for social data and includes statistical data covering the entire region. The information that is in the baseline section needs detailed expansion;
- The important components of the affected environments should be identified and described. The methods and investigations undertaken for this purpose should be disclosed and should be appropriate to the size and complexity of the assessment task. Uncertainty should be indicated;
- Based on data presented, the overall site water balance will be negative. It is not clear how this will impact on water consumption and groundwater availability;

- The types and quantities of waste matter, energy and other residual materials, and the rate at which these will be produced, should be estimated. The ways in which it is proposed to handle and/or treat these wastes and residuals should be indicated. Tailings design should be in compliance with IFC Performance Standard 4;

- The potential impacts have been investigated and described in broad terms. The description should be extended to distinguish between direct effects and any indirect, secondary, cumulative, short, medium and long term, permanent and temporary, as well as positive and negative effects of the project;

- During the assessment of impact, arrangements should be made to collect the opinions and concerns of relevant public agencies, special interest groups, and the general public. Public meetings, seminars, discussion groups, etc. may be arranged to facilitate this;

- The intention of a Scoping study is to allow key impacts to be identified and selected for more intense investigation. This stage does not appear to have been addressed within the current document;

- Reference is made to an impact on the Orel reservation in the immediate proximity of Garinskoye-Shimanovsk, yet there is no mention of this reserve in the Baseline study section; and

- Any residual or unmitigated impacts should be indicated and justification offered as to why these impacts should not be mitigated.

4.10.3 Review of Environmental and Social Action Plan and Health, Safety, Environment and Community Measures

As sites move from exploration to development, responsibilities to staff, the communities within which they operate and to the environment of the project areas, all increase significantly. IRC's environmental, health, safety and social policies are designed to comply, firstly with Russian regulatory requirements as implemented under the supervision of Rosprirodnadzor and with international good practice. IRC has stated that they will be using best endeavours to comply with the IFC Performance Standards on social and environmental sustainability as well as with the IFC Environmental, Health and Safety ('EHS') guidelines.

IFC undertook a due diligence study in 2007 and an Environmental and Social Action Plan (ESAP) was developed jointly by IFC and Aricom in compliance with IFC Performance Standards. This document guides further management tools to ensure continued compliance in respect of health, safety, environment and social issues at IRC's sites.

An overall strategy for Public Consultation and Disclosure at Garinskoye is contained in a document 'Strategy of Consultation and Public Information — Aricom Projects Kuranakh, Kimkanskoye and Sutarskoye, 2007' prepared by DEB for IRC. IRC has agreed to engage further with local stakeholders at all project sites.

Due to the remote location of the sites IRC has an 'open door policy' with regard to the use of their medical facilities by the local communities should the local facilities be insufficient.

Responsibility for health and safety lies with the General Director at Garinskoye GOK during the exploration and development stage. Contractors have their own organisational arrangements.

In 2009, IRC formed a Health, Safety and Environment committee, and has committed to demonstrate that during both the construction and operation of the project, it will be in compliance with the environmental, labour, health and safety regulations of the Russian Federation, as well as international best practice to meet the requirements of IFC Performance Standards on Social and Environmental Sustainability. IRC aims to address corporate issues as well as potential impacts for each project. A HR labour and training plan has recently been submitted to IFC for review.

The environmental and social management structure within IRC is emerging following the appointment of environmental specialists at project sites. IRC is in the process of creating a dedicated unit, with responsibility for monitoring and ensuring compliance with environmental and community requirements and to deal with any issues arising. This unit will be under the control of the Group's Environmental Manager. The Environmental Manager will control and manage the environmental and social planning process and ensure that all plans that are implemented comply with state and international standards.

An appointment as Head of the Environment Department for Garinskoye, reporting directly to the General Manager of Garinskoye GOK was made in H2, 2009. Functional control will also be exerted through the IRC Group Environmental Manager.

Within the ESIAs commitments have been made that the health and safety system will satisfy the demands of Russian standards and International principles and that the system will satisfy basic international standards of labour protection and industrial safety (including OHSAS 18001). Thus, the system will include:

- Labour protection and industrial safety standards;
- Obligation to constantly raise safety standards;
- Continual staff and contractor training;
- Application of risk assessment methodology; and
- Procedural control.

WAI Comment: *WAI considers that the Corporate Public Consultation and Disclosure Strategy is well set and in line with both international best practice and Russian Federation requirements. This now needs to be refined into Public Consultation and Disclosure Plans specific to the circumstances at each project site.*

WAI considers that a comprehensive, corporate HSE Management System and site-specific, HSE Management Plans are required for the next stage of development at Kimkan, Sutara and Garinskoye to meet both State and IFC Performance Standards requirements. Significant effort and external support will be required in order to develop these tools in a timely manner. WAI commends the commitment to introduce and meet *international standards as a positive and proactive step towards enabling compliance and this should form the basis for ensuring HSEC improvement over time. WAI considers that a full set of Management Plans should be prepared within the next two years (i.e. by 2012).*

WAI is aware that labour safety culture in Russia is developing but a rapid introduction of OHSAS 18001 would stretch the current safety and administration resources. Support will be necessary from specialists having experience of introducing such systems. WAI would recommend that HSE Management adopt the principle of OHSAS 18001 and that management plans are introduced in-line with that standard, and that full accreditation becomes a medium-term goal.

4.10.4 Closure and Rehabilitation

Closing a mining and processing operation poses risks and opportunities that need to be identified, assessed and managed. An important aspect when planning for closure is the development of a post-mining plan. Understanding the needs, aspirations and concerns, particularly those of the authorities and local communities, is critical to this process. Whether or not a property will require ongoing care, maintenance and monitoring will also feature in the long-term closure plan and the ultimate end land-use. IRC has therefore prepared conceptual closure and rehabilitation plans for Kimkan, Sutara and Garinskoye.

Although there is currently no specific requirement or guidelines for closure management under Russian State or Federal law IRC is setting aside amounts of monies determined by international consultants familiar with closure costs.

As IRC develops new projects, it is intended that each asset will review existing corporate plans and make adjustments as required to meet the new requirements. This review will include a rigorous assessment of site specific closure risks and opportunities, identification of risk management actions and development of reasonable and accurate closure cost estimates.

The conceptual mine closure and rehabilitation plans are included within the ESIA submissions. This plan is stated as ensuring that the following requirements are met:

- Project complies with Russian law regarding enterprise closure and rehabilitation activities;
- Conditions of maximum possible beneficial use and stable deposit site area after enterprise closure;
- Safety for visitors to the site area after closure;
- Reduction of possible negative impacts to the environment;
- Prevention of negative social consequences after the enterprise closure; and
- Sufficient financial support for all planned activities for enterprise closure and rehabilitation.

According to the Feasibility Study (2009), the provision for rehabilitation at Garinskoye is US$10.7 million.

> ***WAI Comment:*** *WAI considers that sufficient detail has been included within the plans at the concept stage. Further development and refinement of the plan should be included as the site operations progress. WAI further considers that the level of cost allocated to closure funding is adequate and inline with other operations of a similar scale, nature and location.*

4.11 Conclusions

The Garinskoye iron-ore deposit has been explored and studied extensively. It has a favourable geographic position in relation to probable iron ore consumers in northern PRC.

Garinskoye is currently an active exploration/development project. No mining has taken place on the site. IRC has completed scoping studies and a feasibility studies detailing future plans.

Having reviewed all of the available data relating to the Garinskoye mine, WAI considers all aspects of the mining project to be technically and financially sound, however, the project does rely on the construction of a new railway by the Federal Government.

The Mineral Resource estimates have been examined. The Mineral Resource methodology has been accurately documented and conforms to the guidelines of the JORC Code (2004). Ore Reserves are also classified in accordance with the guidelines of the JORC Code (2004).

Substantial infrastructural development is required and needs to be in place prior to mine development, including the construction of a 121km conveyor belt. As of the February 2010 site visit, the access road has not been constructed but surveying has commenced. WAI considers the mining method to be sound, and a mining schedule has been provided which WAI considers to achievable.

5 KOSTENGINSKOYE

5.1 Location

The Kostenginskoye iron ore deposit is situated in the Obluchensky District of the EAO Region of the Russian Federation, and lies some 35km to the south of the Izvestkovaya station on the Trans-Siberian Railway, and 24 km to the south of the Kimkan deposit.

The Kostenginskoye deposit is located due south of the K&S deposits, and it is understood that the Kostenginskoye deposit represents a natural continuation of K&S in the future since, on a macro basis, it can be considered as an extension of the same zone.

5.2 Licence Information

In May 2007 "LLC Optima", a 100% subsidiary of IRC, obtained a licence for the Kostenginskoye iron ore deposit (licence "BIR 00421 TE" dated 28 May 2007, reviewed in January 2009). The licence allows exploration works with subsequent mining operations. Exploration works are not restricted by depth according to the terms of the licence. The coordinates of the licence boundary are given in Table 5.1, and shown in Figure 5.1 below.

Table 5.1: Coordinates of the Licence Boundary

	Northing			Easting		
Point	Degrees	Minutes	Seconds	Degrees	Minutes	Seconds
1	48	45	00	131	26	15
2	48	45	00	131	27	45
3	48	38	40	131	29	58
4	48	38	40	131	27	45

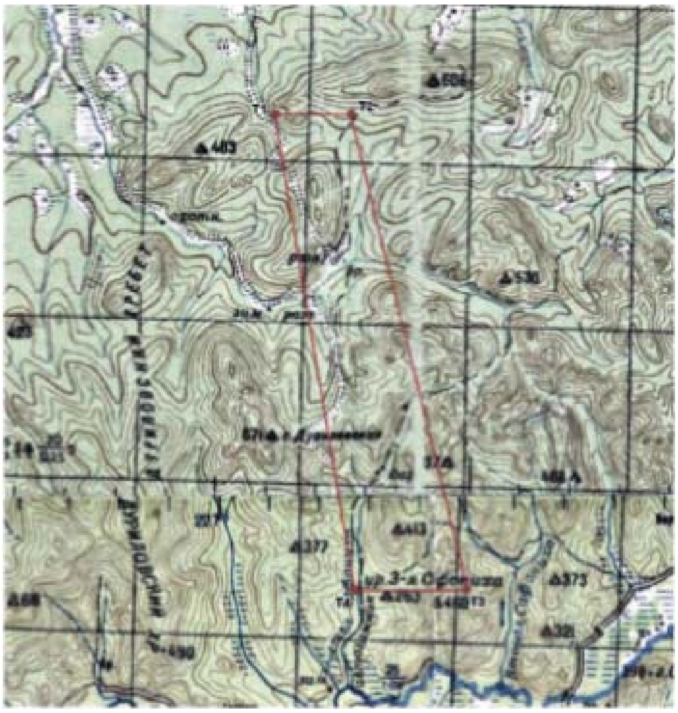

Figure 5.1: Kostenginskoye Licence Boundary

The total area of licence is 24km^2. In accordance with the licence agreement, the boundaries of the licensed area will be refined based on the results of the exploration works. The licence is valid until 31 December 2027 and it is renewable with the consent of the licensing authority.

5.3 History

The Kostenginskoye iron ore deposit was discovered in 1952-53 during geophysics research of the Malo-Khinganskiy iron ore field. During the period 1967-75, preliminary exploration works took place and a preliminary resource estimation was performed. There have been no changes made to its resource statement since that time.

5.4 Geological Setting

The deposit is formed by metamorphosed sedimentary and volcanogenic sedimentary rocks of the upper Protozoic, lower Cambrian and lower Cretaceous age, together with intrusive rocks. At water sheds and hill slopes, elluvial and delluvial formations with thickness of up to 3-4m, are well defined by loam and sands. The cross-section of stratified layers is comparable to other cross-sections of the Malo-Khinganskiy iron ore field. The cross-sections are formed by the Murandavskaya suite (of the upper Proterozoic, comprising fine and medium sized material), covered by the ore-bearing suite (of the lower Camrian).

The ore-bearing suite is split into three horizons (named: sub-orebearing, orebearing, above-orebearing), and is formed by siliceous, clayly, and carbonaceous quartz-sericite schists, clayly dolomites, tuff breccias, tuffites, and iron quartzites. Within the lower part of the ore-bearing horizon, a batch of green schists and chlorite-carbonaceous breccias is marked out. This batch has low-grade carbonaceous-manganese mineralization (the manganese grade can be as high as 8-10%). The thickness of ore horizon varies from 10-15m to 70-80m.

Hydrogeological conditions at the deposit were studied by specialist organisations in the 1960s-70's, and are complicated by the presence of five water-bearing complexes, which have sophisticated interrelations. These studies predicted maximum water inflow into the potential open pit of around 1,000m^3/h, rising to 8,000m^3/h due to meteorological conditions.

5.5 Mineralisation

The deposit consists of 8 orebodies. Orebody No. 1 is located in the thickest area of the ore-bearing horizon, at the southern part of the eastern wing of the Eastern syncline. Orebody No. 1 has been explored to a preliminary standard, whilst the remaining orebodies, which have low thickness and low grade, have only been studied via individual trenches and boreholes.

Orebody No. 1 extends 6km along strike, and 400-500m down dip. It consists of two tectonical blocks. The orebody has a simple flat shape, dipping 60-70° to the west. The thickness of the orebody increases uniformly to the centre (up to 40-50m) before decreasing rapidly in thickness to around 11m in the northern flank, averaging 36m. The orebody is formed by streaky fine-grained magnetite, magnetite-haematite, carbonaceous-siliceous, and carbonaceous-magnetite quartzite.

There are two industrial ores: magnetite and magnetite-haematite. The magnetite ore provides 70% of the overall resources of Orebody No. 1. The average grades for this type of ore are: Fe_{total} – 30.73%; $Fe_{magnetite}$ – 21.41%; S – 0.15%; and P – 0.23%. Should a combined magnetic-flotation scheme be implemented for this type of ore, it will be possible to extract 75-80% of the iron into a 61-62% concentrate product.

Magnetite-haematite ores represent 25.7% of the overall resource in Orebody No. 1. The average grades for this type of ore are: Fe_{total} – 32.29%; $Fe_{magnetite}$ – 9.68%; S – 0.07%; and P – 0.21%. The ore should be treated by employing roasting and a magnetic separation scheme, to allow extraction of up to 83-85% of iron into a 60% concentrate product.

The average chemical composition of the ore is: Fe_{total} – 31.58%; $Fe_{magnetite}$ – 17.82%; SO_2 – 40.11%; Al_2O_3 – 2.09%; TiO_2 – 0.19%; CaO – 2.24%; MgO – 2.81%; MnO – 0.93%; S – 0.03%; and P – 0.22%.

5.6 Technological Testing

In 1977, the Sibelektrostal enterprise (a testing and analysis company) performed technological testing on 53 technological samples of magnetite, magnetite-haematite and mixed ores from Kimkan, Sutara and Kostenginskoye. It was established that the ore composition at the three deposits have high levels of similarity, and that the ores can be treated using a single technological flowsheet. For magnetite ores, a 4-staged scheme of magnetic ore enrichment was recommended, provided that the iron recovery would be at least 73.0% to produce a 64.4% concentrate product. For mixed ores it was recommended that magnetic-roasting, magnetic and magnetic-gravity separation processes were used, providing 83.4% and 73.9% recovery into 60.0% and 60.3% concentrate products respectively.

As selective mining was not possible due to the nature of the deposit, it was recommended the various types of the ore be processed by employing a single 'averaged' scheme, capable of processing all ore types.

5.7 Historical and Projected Exploration Works

Historical exploration works, performed during 1967-1975 by the Khabarovsk Regional Geological Survey are summarised below:

- Core drilling: 20,101m;
- Trenching: 65,038m^3;
- Exploration Shafts and Cross-cuts: 407m;
- Technological Sampling: 15 Samples.

In 2008, IRC employed Dalgeophysica to prepare an exploration plan. The plan was approved by the relevant state authority and registered. The scope of the exploration works, considered within the plan is as follows:

- Boreholes:
  - Exploration: 192 holes totalling 39,585m;
  - Technological: 37 holes totalling 4,780m;
  - Hydrogeological: 33 holes totalling 2,800m;
  - Waste holes: 5 holes totalling 500m.
  - Trenching: 74 trenches providing 159,600m^3;
  - Magnetic studies (1:10000): Covering 10km^2;
  - Magnetic studies (1:5000): Covering 2.5km^2;
  - Sampling: 17,641 samples.

These works are to be accompanied by environmental research, consisting of ecological traversing (24km per each type of sampling); water sampling (17 samples); snow sampling (22 samples); soil sampling (44 samples); air chemical composition analysis and monitoring. All of the projected works will be carried out in accordance with the licence agreement.

5.8 Preliminary Resource Estimation

The Kostenginskoye Orebody No. 1 was extensively explored during Soviet times. These resources were not approved by GKZ due to the lack of technological research on the ore and absence of economically viable scheme of processing for magnetite-haematite and mixed ores, however WAI believes that it indicates the potential of the deposit given its close proximity and similarity to K&S.

5.9 Environmental and Social Issues

Given the early stage of the project, no environmental and social information is currently available for review.

During 2008 to 2009, engineering and environmental studies were conducted to fully evaluate the baseline condition of the environment at the Kostenginskoye Deposit. The studies were performed by a specialised licensed organisation, Dalgeophysica. As a result of the studies, information was acquired on the condition of the atmospheric air, water, soils, radiation level, snow cover etc. Since 2009, the Khabarovsk office of TINRO (Pacific Scientific Institute of Fishery and Oceanography) have been conducting studies of aquatic biological resources of water courses in the area. In 2009 and 2010, Khabarovsk Meteorological Centre carried out studies regarding the atmospheric air, and Dalgeophysica carried out studies regarding the water, soil and bed sediments.

6 BOLSHOI SEYM

6.1 Introduction

In February 2006, IRC entered into an agreement with Intergeo. The agreement allowed for the establishment of a new holding company for Uralmining, the company that owns the licence to develop the Bolshoi Seym deposit. The holding company would be 49% owned by IRC and 51% owned by Intergeo.

Previous metallurgical test work has shown that, as with the Kuranakh Project, it is possible to produce a 62.5% Fe concentrate and an ilmenite concentrate with up to 49.9% TiO_2.

6.2 Property Description

6.2.1 Location, Access and Infrastructure

The Bolshoi Seym deposit is located in the Tyndinskiy region, 37km from the Yuktali station (on the Baikal Amur railway) and approximately 40km to the south east of Olekma, where IRC is constructing its Kuranakh Project process plant. Therefore it represents a natural extension to IRC's activities in this area.

The infrastructure and access are currently provided via the Kuranakh Deposit which lies at a distance of approximately 40km to the north-west of Bolshoi Seym.

The deposit is located on the top of a smooth sided hill at an elevation of 430 -1,277m, which almost devoid of trees, but is covered in dense low level vegetation.

6.2.2 Mineral Rights and Permitting

The mineral licence covers an area of 26km^2 and extends to a depth of 1,000m. The licence was granted to Uralmining in November 2005 and has a term of 25 years, which may be extended with the consent of the licensing authority. The licence requirement is to start production by 01 December 2012 with a minimum extraction rate of 2Mtpa, however this licence may be extended with the consent of the licencing authority.

The coordinates of the licence are given in Table 6.1 below.

Table 6.1: Coordinates of the Licence

Point	Latitude (N)	Longitude (E)
1	56°43'20"	120°53'30"
2	56°43'00"	120°53'20"
3	56°43'00"	120°53'20"
4	56°43'25"	120°54'30"

6.3 Geological Setting

6.3.1 Regional Geology

The Bolshoi Seym deposit is located within the Olekmenskiy Block which is identified at the western margin of the Stanavoy Fold-Block System (Please refer to Figure 6.1). The Fold-Block System borders the Aldan Shield which lies to the north. The deposit is Hosted by the western part of the Khuranakh branch of the Kalar Anorthosite Massive.

The area comprises of Lower and Upper Archean, as well as Upper Archean-Lower Proterozoic metamorphic rocks and Archean-Proterozoic intrusive rocks. The region passes through several tectonic and metamorphic phases with the metamorphism from granulite to greenstone stages. Quaternary sediments have limited extent.

The early Archean Kalar Gabbro-Anorthosite Massive is the main geological feature in the area, which has an area of approximately 1,500km^2. The Massive is hosted within a formation of deeply metamorphosed Lower Archean. The Kalar Massiif is cut by the east-west striking Imangrsk Fault Zone which divides it into two parts, the Imangakitsk zone to the south and the Khuranakh zone to the North. The Bolshoi Seym Deposit is located within the south-east flank of the Khuranakh zone.

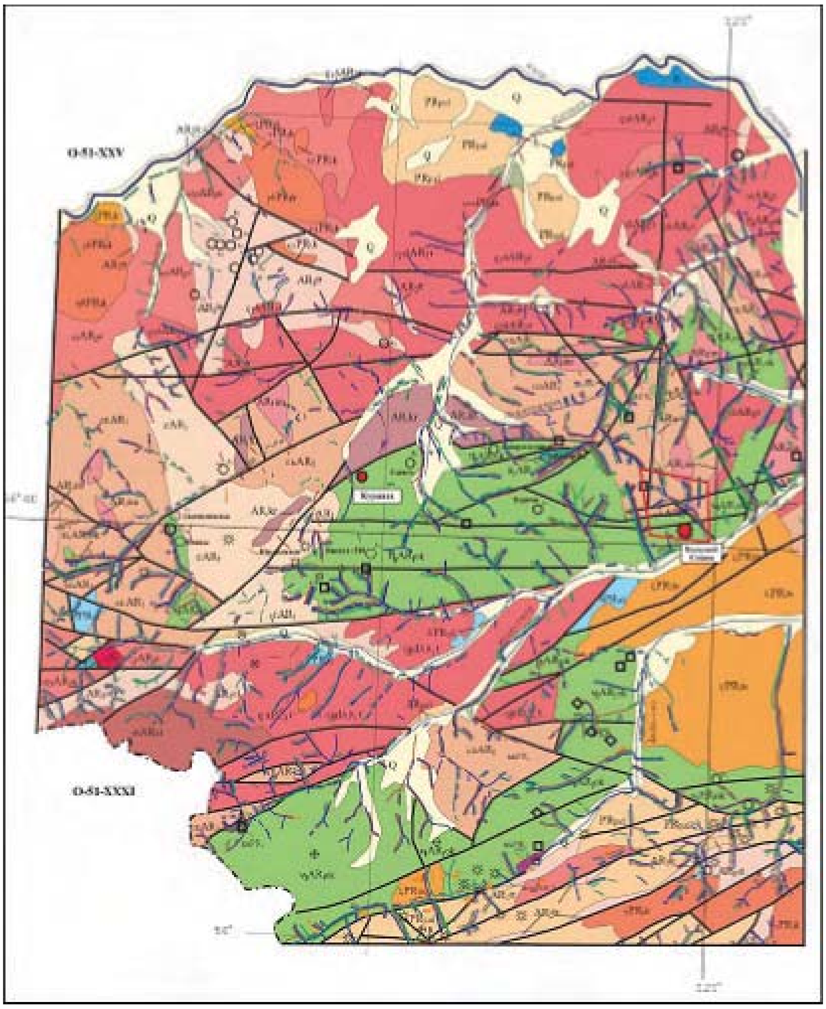

Figure 6.1: Regional Geology of the Area (Not to Scale)

6.3.2 Local Geology

The Bolshoi Seym deposit is hosted by gabbro-anorthosite of the Kolar Massive, which is comprised of metagabbro, ultrabasic rocks as well as lamprophyre (Please refer to Figure 6.2). These rocks form tabulated steep dipping bodies, which have been folded into isoclinals folds. The thickness of the mineralised complex varies from 200 – 250m at the limbs to 500-600m in the hinge. The steep dip of 75 – 85° has been proven by drilling to the depth of 350-400m. From geophysical evidence it would appear that the mineralisation extends to a depth of 400m on the west limb and 700m on the east limb. It is also interpreted that these limbs join at depth.

The Metagabbro forms approximately 85% of the host rocks. The gabbro is a dark-grey fine to medium grained rock with a clear green tint; comprising of pyroxene and plagioclase. Ultrabasic rocks form lenses and vein-like bodies of mineralised pyroxenite, which make up some 95%; the remainder consists of hornblendite (5%) and very rarely peridotite. Their thickness is normally in the region of 2 – 5m, but can be as wide as 50m in some exceptional intersections. Strike length varies from tens to a few hundreds of meters.

Lamprophyre of basic composition comprises of microgabbro-norite also known as "vein gabbro" which forms dykes and bodies of complex shape with thickness up to few tens of metres and strike lengths of a few hundred metres.

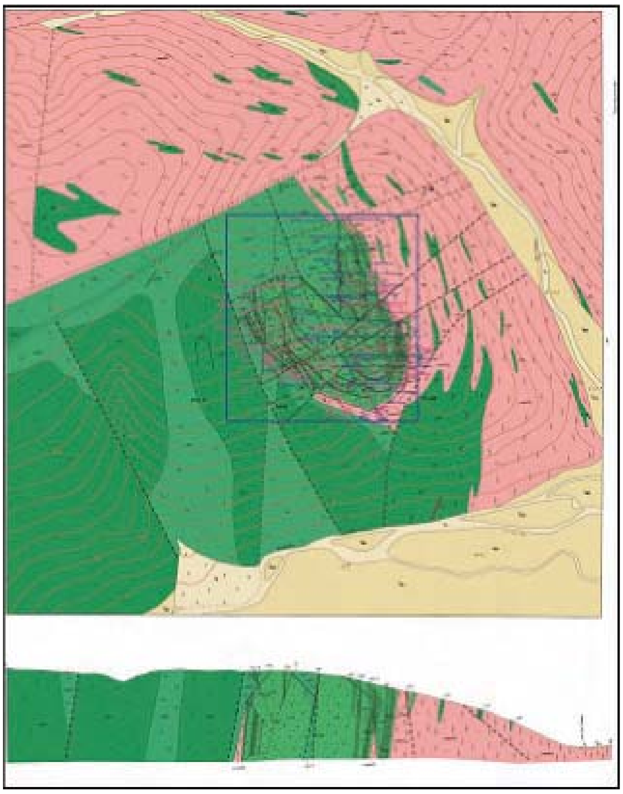

Figure 6.2: Local Geology of Bolshoi Seym (Not to Scale)

6.3.3 Mineralisation

Potentially economical mineralisation at Bolshoi Seym comprises stringer-veinlet and massive ilmenite and magnetite.

Disseminated mineralisation has also been identified; however this mineralisation was excluded from the Russian System resources as being un-economical.

Massive mineralisation comprises of 90 – 99% (by volume) of ilmenomagnetite, ilmenite and magnetite. The remainder is made up of spinel, hornblende and rare garnet, biotite and pyroxene.

The stringer-veinlet mineralisation contains 15 – 30% (by volume) of magnetite and ilmenite. The remainder is made up of plagioclase (60%), pyroxene (~20%), hornblend and biotite. Occasional garnet, spinel, quartz and some other minerals have also been identified.

Two zones have been identified at the deposit: the Eastern and Western Ore Zones.

The Eastern Zone strikes 345°, with a dip to the south-west of 70 – 85°. The ore zone footwall is normally sharp and it coincides with the contact between the metagabbro and granite-gneiss country rock; whereas towards the hangingwall, mineralisation changes gradually to low grade and unmineralised gabbro. The hangingwall contact can only be identified by assay. Massive mineralisation is situated in the footwall of the zone; whereas stringer-veinlet mineralisation can normally be found against the hanging wall.

The proven strike length of the Eastern Zone is 1,000m and the geophysical survey suggests that it can be extended to 1,450m. The average thickness is 219m with variation from 150m at the north-west end to 300m at the south-west. Drilling performed to date suggests that the thickness remains approximately constant at this depth.

The north-east striking Eastern Zone is broken into three blocks by faulting; the south-east block is down thrown, whereas the north-west block is raised. The exact vertical displacements are unknown, whilst the horizontal displacements are in the region of 30 –70m.

The Western Ore Zone roughly mirrors the Eastern Zone. It strikes 320° and dips at 75 – 85° to the south-west. The proven strike length is 550m with a strike length postulated from geophysics of 1,300m. The Ore Zone thickness varies from 180 to 370m with an average of 220m. The down-dip extent of mineralisation, estimated from the geophysics is in the range of 300m – 700m (north-west — south-east).

The hangingwall of the ore zone is sharp, controlled by the contact between metagabbro on one side and leucocratic-gabbro and country granite-gneiss on the other. The footwall contact is gradual, defined by assay. Massive and rich stringer-veinlet mineralisation is situated on the hangingwall; whereas low grade disseminated mineralisation is located on the footwall.

Similar to the Eastern Ore Zone, the Western Ore Zone is broken into blocks by steep faults with displacements of up to 100 – 200m.

6.4 Exploration

6.4.1 Historical Exploration

Exploration works have been conducted by Vostok Geology (an exploration company run by OJSC Norilsk Nickel).

Up until 1990, exploration works consisted of the following:

- Trenches: 4,608m;
- Drillholes: 2,890.9m; and
- Testwork samples: 2.

Regional and local geology is shown in Figures 6.1 to 6.3, with cross-sections through the deposit shown in Figure 6.4.

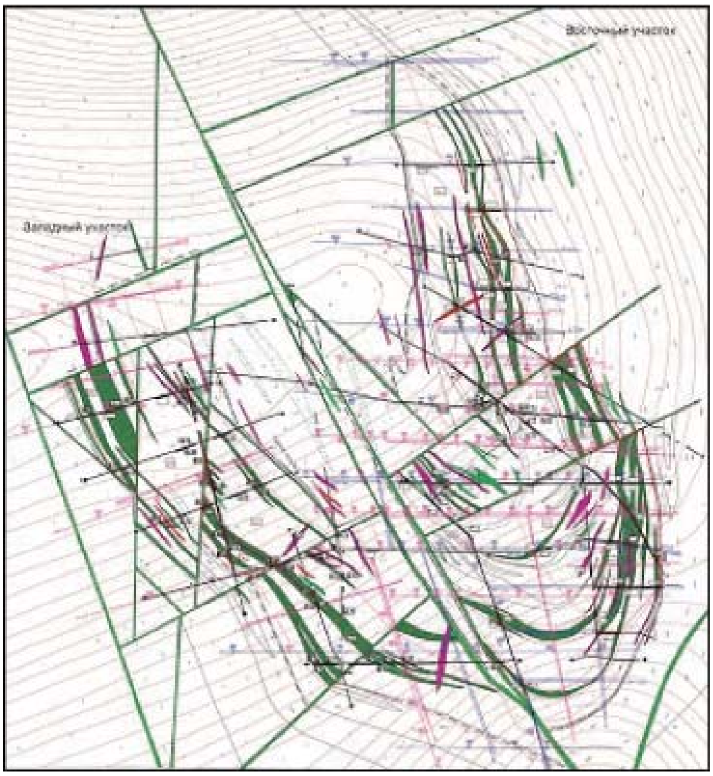

Figure 6.3: Plan Illustrating the Ring Dyke Structure to the Deposit (Not to Scale)

(Together with Proposed and Accomplished Explorations Works to date)

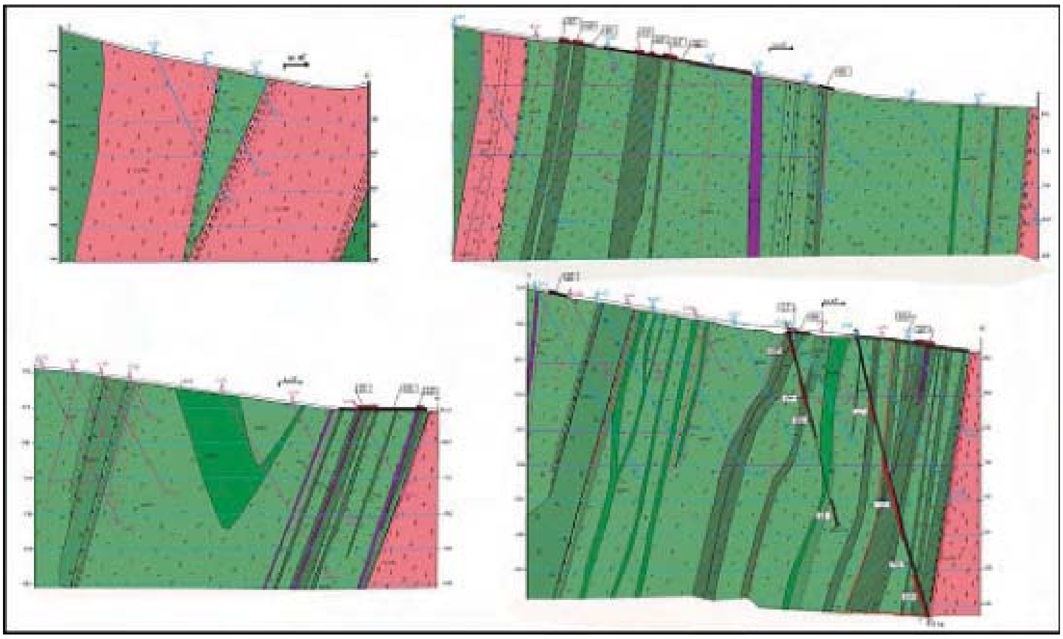

Figure 6.4: Typical Cross Sections through the Deposit (Not to Scale)

6.4.2 Proposed Exploration Programme

Geological exploration works at Bolshoi Seym were conducted between 2007 and 2009 by "Vostokgeologia" exploration company. The works have been completed and include:

- Trenching works – 10,500m^3
- Exploration drilling – 38,382m
- Hydrogeological drilling – 852.4m
- Channel samples – 3,400
- Core samples – 19,102
- Group borehole samples – 195
- Technological laboratory samples – 5
- Technological semi-production samples – 2
- Technological samples for geological-technological map – 41
- Geological-environmental samples – 46
- Hydrogeological samples – 8
- Internal control samples – 1,040
- External control samples – 707

Based on the results of the exploration works, the geological exploration report with TEO conditions and a reserve estimation is being prepared and will be submitted to the State Reserve Committee for expertise in December 2010. All of the samples taken have been tested and analysed. Based on these results, Gipronickel Institute has produced the following reports:

- Study of metallisation of Bolshoi Seym ilmenite and titanomagnetite ores;
- Report on geological-technological mapping, composition and beneficiation characteristics of Bolshoi Seym ilmenite and titanomagnetite ores; and
- Bolshoi Seym titanomagnetite and ilmenite processing methodology.

6.5 Current Resources

The exploration works and resource estimate were undertaken during the Tynda Expedition (an exploration of mineral deposits in the Tynda area of the Amur Region) between 1986 and 1988. A Pre-Feasibility study was undertaken in 1990, with a final Exploration Report issued in 2006.

The results of the exploration (Kulakov, 1988) were **not** State approved mineral resources under the Russian System, and as such without the undertaking of confirmatory drilling and exploration, conversion to meet the guidelines of the JORC Code (2004) would not be possible. Details of the results of the exploration have previously been published by the IRC Group.

6.6 Environmental and Social Issues

Given the early stage of the project, no environmental and social information is currently available for review.

> ***WAI Comment:*** *There is the potential for environmental and social damage to occur even during the exploration stage, if appropriate management measures are not included. Therefore, WAI would recommend that these issues should be identified as soon as possible, with an early commencement of appropriate environmental and social assessments. To this end, WAI would suggest that after issues have been scoped, a full programme of baseline data collection should be implemented, to ensure that pre-operational environmental and social conditions are adequately characterised. This is particularly important since baseline data collection needs to be representative of seasonal cycles and as such usually requires 12-18 months of data collection. This would then stand IRC in good stead to continue with OVOS and ESIA studies to satisfy national and international requirements.*

7 RISK ANALYSIS

WAI has produced a qualitative risk assessment of risk factors associated with the IRC iron ore projects. The risk assessment provides readers of this report with a summary of significant risks to IRC and its properties. The risk assessment summaries risk factors associated with the projects and then analyses the degree of risk through examining the likelihood of a risk factor occurring within 7 years and the consequences of that risk factor occurring.

The likelihood of a risk factor occurring (within 7 years) can be considered as:

- Likely: will probably occur;
- Possible: may occur; and
- Unlikely: unlikely to occur.

The consequences of a risk factor can be classified as:

- **Major Risk:** the factor poses an immediate danger of failure, which if uncorrected, will have a material effect (>15% to 20%) on the project cash flow and performance and could lead to project failure;
- **Moderate Risk:** the factor, if uncorrected, could have a significant effect (10% to 15%) on project cash flow and performance unless mitigated by some corrective action; and
- **Minor Risk:** the factor, if uncorrected, will have little or no effect (<10%) on project cash flow and performance.

The overall risk assessment rating based on the above likelihood and consequences can be summarised as shown in Table 7.1 below.

Table 7.1: Overall Risk Assessment Rating

Likelihood of Risk (within 7 years)	Consequence of Risk		
	Minor	**Moderate**	**Major**
Likely	Medium	High	High
Possible	Low	Medium	High
Unlikely	Low	Low	Medium

The risk factors identified by WAI for the IRC iron ore projects, their likelihood and consequences of occurrence and overall risk rating are shown in Table 7.2 below. Where risks relate to all deposits, this has been highlighted.

Table 7.2: IRC Iron Ore Projects — Risk Assessment

Risk Factor Identified	Project(s)	Likelihood Rating	Consequence Rating	Overall Risk Rating
Geological Risk Factors				
Lack of significant resources	All	Unlikely	Major	**Medium**
Loss of significant reserves	All	Unlikely	Major	**Medium**
Failure to renew licences	All	Unlikely	Major	**Medium**
Reduction in expected iron grade	All	Unlikely	Moderate	**Low**
Inability to explore and classify *Inferred* Resources and flank deposits	All	Unlikely	Minor	**Low**
Mining Risk Factors				
Poor weather preventing mining activity	All	Likely	Moderate	**High**
Pit wall failure due to geotechnical instability	All	Possible	Moderate	**Medium**
Greater than expected groundwater ingress	All	Possible	Moderate	**Medium**
Orebody complex and not suited to bulk mining	All	Unlikely	Major	**Medium**
Production Shortfalls	All	Likely	Minor	**Medium**
Excessive dilution or losses	All	Possible	Moderate	**Medium**
Inadequate grade control	All	Possible	Moderate	**Medium**
Higher consumable requirements than estimated	All	Possible	Moderate	**Medium**
Key mining equipment mechanical or electrical failure	All	Possible	Minor	**Low**
Loss of power and/or water supply	All	Possible	Moderate	**Medium**
	Garinskoye	Possible	Minor	**Low**
Industrial action by workforce	All	Unlikely	Moderate	**Low**
Processing Risk Factors				
Mineralogy more complex/variable than predicted	All Emphasis on Kuranakh	Possible	Major	**High**
Lower product recovery than anticipated	All Emphasis on Kuranakh	Possible	Major	**High**
Loss of power and/or water supply	All	Possible	Moderate	**Medium**

Risk Factor Identified	Project(s)	Likelihood Rating	Consequence Rating	Overall Risk Rating
Failure to produce concentrate within saleable specifications	Garinskoye	Unlikely	Major	**Medium**
Key processing equipment mechanical or electrical failure	All	Possible	Minor	**Low**
ITmk3 unable to be scaled to meet production requirements	K&S Only	Possible	Moderate	**Medium**
Higher consumable demand than estimated	All	Possible	Minor	**Low**
Poor weather preventing processing activity	All	Unlikely	Minor	**Low**
Industrial action by workforce	All	Unlikely	Moderate	**Low**
Transport Risk Factors				
Failure of rail loading/unloading equipment	All	Possible	Moderate	**Medium**
Interruption to rail transportation of concentrate (external influences)	All	Unlikely	Major	**Medium**
Excessive moisture in concentrate	All	Possible	Moderate	**Medium**
Poor weather causing concentrate to freeze	All	Likely	Minor	**Medium**
Congestion or lack of capacity on TranSib and/or BAM rail lines	All	Possible	Moderate	**Medium**
Closure of border between Russia and China	All	Unlikely	Major	**Medium**
Interruption to supply of materials, spares and consumables by rail (external influences)	All	Unlikely	Moderate	**Low**
Conveyor belt failure	Garinskoye	Possible	Moderate	**Medium**
Environmental, Health, Safety and Communities Risk Factors				
Failure to obtain regulatory approvals	All	Unlikely	Major	**Medium**
Failure to meet international standards of best practice	All	Possible	Moderate	**Medium**
Water discharge non-compliance	K&S, Kuranakh	Possible	Moderate	**Medium**
	Garinskoye	Unlikely	Moderate	**Low**
Loss of long term stability/integrity of TMF	All	Possible	Moderate	**Medium**
Capital and Operating Cost Risk Factors				
Power and fuel price increases in future	All	Likely	Moderate	**High**
Wage and salary increases in future	All	Likely	Minor	**Medium**
Project timing delays	All	Possible	Moderate	**Medium**
Equipment supply problems due to high demand	All	Possible	Moderate	**Medium**
Operating costs underestimated	All	Possible	Moderate	**Medium**
Capital costs underestimated	All	Unlikely	Moderate	**Low**

Risk Factor Identified	Project(s)	Likelihood Rating	Consequence Rating	Overall Risk Rating
Project Implementation Risk Factors				
Unable to sell 4.8Mtpa fine grained (pellet feed) concentrate to the PRC market	K&S Only	Possible	Major	**High**
Lower metal prices than forecast	All	Possible	Major	**High**
Failure to secure finance	K&S, Garinskoye	Possible	Major	**High**
	Kuranakh	Unlikely	Major	**Medium**
Failure to market concentrates	All	Unlikely	Major	**Medium**
Insufficient management experience	All	Unlikely	Moderate	**Low**

Risk factors with high risk ratings are discussed further below:

Poor weather preventing mining activity:

WAI considers this is to be a significant risk factor for all mining operations within the Russian Far East due to the harsh winter climate with freezing temperatures and the subsequent spring thaw giving rise to possible flooding. IRC and its personnel, however, have a great deal of operational experience within these climatic conditions and the infrastructure and equipment has been designed/selected with the prevailing climatic conditions in mind. WAI, therefore, considers that IRC has sufficiently mitigated this risk.

Mineralogy more complex/variable than predicted:

Although testwork has been conducted on bulk samples that are statistically determined to be representative of the production scale ore feed, there remains a risk that the mineralogy of the ore will be more complex than the original testwork and design predicted. While the likelihood of this occurring is low (but possible), the consequences are potentially high. The effects of this risk factor can only be mitigated through careful monitoring and analysis throughout the processing operations. If problems with complex variable ores are encountered, then blending could be required at both the mining and processing stages. WAI believes that IRC has sufficiently experienced personnel to identify and resolve these issues should they be encountered.

Lower product recovery than anticipated:

The percentage recovery of iron and other elements is estimated based on the results of testwork conducted using laboratory and pilot plant scale equipment. There is a risk that the same recoveries will not be achieved when the operations are scaled up into the full sized plant. The risk of this occurring is, in WAI's opinion, mitigated through IRC's use of industry standard technology and equipment, which is widely understood and the performance criteria well known. In addition, the design of the processing operations is relatively flexible allowing the flowsheet to be altered to accommodate design changes if required.

Power and fuel price increases in future:

The forecasting of future energy and consumable prices is difficult for any mining or processing operation. Both the mining and processing operations are energy intensive, relying on diesel fuel, electricity and coal. The cost of these commodities is likely to increase in future, given the recent price trend history, and the effects of increases beyond those predicted by IRC could be significant to the overall profitability of the operations. WAI is of the opinion that IRC has allowed for price increases to these commodities within its financial models and that those forecast increases are in line with forecasts predicted by industry analysts.

Lower metal prices than forecast:

The forecasting of future metal prices is difficult for any mining operation. The commodity prices used in IRC's financial models are derived from industry specific analysts and are clearly stated. WAI believes that prices derived from independent industry experts are the best possible price forecasts available, but each individual reader must make his own judgements as to whether or not the forecast metal prices are realistic.

Failure to secure finance:

The mine and processing plant at the Kuranakh Project is already in the final stages of completion and, therefore, further significant finance is not required to bring the mine into production. The K&S and Garinskoye projects are only partially completed and will require significant capital expenditure to bring them into production. It is likely that a mixture of debt and equity finance will be required to fund these projects. Failure to secure finance will undoubtedly result in the projects not progressing into production.

Unable to sell 4.8Mtpa fine grained (pellet feed) concentrate to the PRC market:

WAI considers that the Fe and Si contents of ore from the Kimkan deposit means it is only possible to produce a fine grained concentrate (pellet feed), and therefore it is imperative that IRC conduct a market study to identify potential buyers in the PRC to ensure that the annual production of 4.8Mt can be sold. The Kuranakh Project has an offtake agreement for the sale of titanomagnetite concentrate.

8 ITMK3 PROCESSING TECHNOLOGY

8.1 Direct Reduced Iron (DRI)

8.1.1 History

The KSG Feasibility Study (2008) proposed to convert a portion of the iron ore concentrate to 'pig iron' using a developing direct reduction process called ITmk3 if this is economically feasible at the time. It was considered that a good market existed in the PRC for 'pig iron' as a substitute for steel scrap in electric arc furnaces and as a coolant in the BOS steelmaking process.

The ITmk3 process was developed by Midrex, USA in 1994 but is licensed through Kobe Steel (Kobelco), Japan. The Midrex direct reduction (DR) process is the most widely applied process for direct reduced iron (DRI).

'Pig-iron' is the name given to cooled, cast iron tapped from a blast furnace and ITmk3 produces iron in the form of 'nuggets'. IT stands for 'ironmaking technology' and mk3 denotes the third generation of direct reduction or direct ironmaking process after the Midrex shaft furnace and 'Fastmelt' process.

A demonstration plant for ITmk3 was operated in Minnesota during 2004 and, subsequently, a joint venture company 'Mesabi Nugget Delaware' was formed between Steel Dynamics Inc (SDI) of Indiana and Kobe Steel to produce 'iron nuggets' from the iron ores of the Mesabi Range, USA. SDI has a number of 'mini-steelmills' using electric arc furnaces to smelt steel scrap.

The 'Mesabi Nugget' plant was designed to produce 500,000 tonnes per year of 'iron nuggets' and construction began in November 2007.

8.1.2 The ITmk3 Process

In the ITmk3 process, the finely sized iron ore concentrates are mixed with coal as the reductant and agglomerated by addition of a binder and water. The agglomerates do not need to be particularly strong because they are laid on a moving hearth and do not need to survive movement through a shaft or rotary kiln. The coal can be locally sourced and of low grade and low cost.

The agglomerates are then placed upon a rotary hearth and ignited. As the hearth rotates, air is admitted to burn the coal to generate heat and reducing gases. The remarkable aspect of the process is that, during reduction, the gangue content of the iron ore partially melts and migrates to form a separate globule of slag upon the reduced iron 'nugget'. The cooled nuggets are then crushed to liberate the slag and the iron nuggets are recovered by magnetic separation.

The process has been well demonstrated at laboratory scale.

The potential advantages of ITmk3 are;

- No costly pelletising of finely sized iron ore concentrates;
- Use of cheap coal as fuel and reductant; and
- Elimination of gangue as slag permitting processing of lower grade concentrates.

The uncertainties are;

- Technical feasibility of large diameter rotary hearth furnaces, that is, capacity >0.25Mtpa;
- Technical feasibility of slag segregation at full-scale; and
- Elimination (partition) of phosphorus from concentrate to the slag.

The technical uncertainties relate to the operation of large diameter, rotary hearth furnaces in respect of distribution of heat and reducing gases. A unit capacity of 0.5Mtpa or even 1Mtpa is required. Uneven heat distribution could lead to localised melting and failure of the kiln. A second consideration is the elimination of phosphorus which has a strong tendency to follow the iron. This is discussed further in section 8.1.3 below. In early trials, Kobe Steel reported only 40% partition to the slag which is a concern if the iron ore concentrate has a high phosphorus content.

8.1.3 Latest developments

In January 2010, both SDI and Kobe Steel issued press releases announcing the first production of iron nuggets by Mesabi Nugget Delaware with production planned to reach 0.5Mtpa by mid-2010. There have been no further press releases and it is not known what production capacity has been achieved. Neither has the analysis of the iron concentrate produced by SDI from the Mesabi Range (Hoyt Lakes) iron ores been published but the initial press releases suggested low contents of gangue and phosphorus.

With respect to phosphorus removal, the concern for the K&S project is that the chemical analysis of the concentrate indicates a phosphorus content of 0.045% P. If none of the phosphorus is eliminated in the slag the iron nuggets would contain 0.07% P which would probably incur a price penalty as scrap substitute. If 40% of the phosphorus is eliminated, the iron nuggets would contain 0.04% P which may be acceptable but is still very high compared to specifications of <0.02% P. In the KSG Feasibility Study (2008), the K&S concentrate could be blended with a concentrate of iron ore from Garinskoye containing as little as 0.01% P. At present, without more information, it is unclear how this issue can be resolved.

With respect to the previous evaluation of ITmk3 conducted on behalf of IRC by Hatch as referred to earlier in section 3.8.6 (H326515, Jan 2008), some relevant information has been published recently (2010) by Northland Resources Inc (NRI). NRI is exploring iron ore deposits in Finland and Sweden. NRI is considering the use of ITmk3 to produce 'iron nuggets' for the European market for the reasons explained above. One of these iron ore deposits in particular (Hannukainen) is not dissimilar to Garinskoye.

If it can be assumed that the information published by NRI is based upon the most recent performance of the Mesabi Nugget plant, the comparative capital costs and operating costs for a 0.5Mtpa plant are as shown in Table 8.1 below.

Table 8.1: Comparative costs for 0.5 Mt/y ITmk3

Cost	Hatch, 2008	NRI, 2010
Capital US$M	190	335
Operating US$/t	120*	187**

* Low cost, local coal and Russian prices for electrical power, etc

** Published OPEX of $297/t inclusive of iron ore concentrate and European prices

Clearly, although the figures are not directly comparable, the comparison does indicate significant increases to estimated CAPEX and OPEX since 2008 and it will be necessary to repeat the financial evaluation using the more recent cost data.

In summary, the technical viability of the ITmk3 process is still being evaluated, as are the economics of utilising DRI technology in the exploitation of IRC's iron ore deposits.

9 DEFINITIONS AND GLOSSARY OF TERMS

Definitions

"Amur TKZ"	The regional sub-division (for the Amur Region) of GKZ
"BAM"	The Baikal Amur Magistral Railway
"Bolshoi Seym"	The Bolshoi Seym Iron Ore Deposit in the Amur Region of the Russian Federation
"CPR"	Competent Person's Report
"DVIMS"	The far-east branch of the All Russian Scientific Research Institute for Mineral Raw Materials
"EAO Region"	The Evreyskaya Avtonomnaya Oblast (or Jewish Autonomous Region) of the Russian Federation
"Garinskoye"	The Garinskoye Iron Ore Deposit in the Amur Region of the Russian Federation
"Garinskoye Flanks"	A separate licence area surrounding the Garinskoye iron ore deposits.
"Giproruda"	A Russian engineering design institute, majority owned by IRC
"GKZ"	The Russian State Commission (or Committee) of Resources and Reserves See also "Russian System"
"Hatch"	Hatch (an engineering consultancy)
"HKSE" or "Hong Kong Stock Exchange"	The Stock Exchange of Hong Kong
"IFC"	International Finance Corporation, a division of the World Bank
"K&S"	A combined reference to the Kimkanskoye and Sutarskoye Iron Ore Deposits
"Kimkan"	The Kimkanskoye Iron Ore Deposit in the EAO Region of the Russian Federation
"Kostenginskoye"	The Kostenginskoye Iron Ore Deposit in the EAO Region of the Russian Federation
"Kuranakh Project"	The project consisting of the Kuranakh iron ore deposit and Saikta iron ore deposit in the Amur Region of the Russian Federation
"Malavasia"	Malavasia Enterprises Incorporated
"PMHE"	Peter Hambro Mining Engineering
"Regis"	An exploration company, wholly owned by Petropavlovsk plc

"Pig Iron"	The intermediate product of smelting iron ore with coke
"RJC"	RJC Consulting, a UK-based engineering and surveying consultancy, formerly known as "LLC Scientific Production Geological Firm"
"RUR"	The lawful currency for the time being of Russia
"Russia"	The Russian Federation
"Russian System"	The system for the classification and reporting of Mineral Resources and Reserves, administered by GKZ. *(See "GKZ")*
"SRK"	SRK Consulting
"Steel Scrap"	Recyclable steel metal left over from production consumption. Not to be confused with waste products
"Sutara"	The Sutarskoye Iron Ore Deposit in the EAO Region of the Russian Federation
"TMF"	Tailings Management Facility
"UK" or "United Kingdom"	the United Kingdom of Great Britain and Northern Ireland
"US$"	United States Dollar, the lawful currency of the United States of America
"WAI"	Wardell Armstrong International Limited

Units

"°C"	degrees Celsius — a thermal unit equivalent to Kelvin+273.15
"Ga"	billion years — a unit of geological time
"kg"	kilogramme — the SI unit of mass
"km"	kilometres — a unit of length equivalent to 1,000m
"km^2"	square kilometres — a unit of area equivalent to 1,000,000m^2
"kV"	kilo-volt — a unit of electrical potential difference
"m"	metres — the SI unit of length
"m^3"	cubic meter — a unit of volume
"Ma"	million years — a unit of geological time
"Mt"	million tonnes
"mm"	Millimetres — unit of length equivalent to 0.001m
"Mtpa"	million tonnes per annum
"sq.m."	square metre — a unit of area
"t"	a metric tonne — a unit of mass equivalent to 1,000kg
"tpa"	tonnes per annum

Chemical Symbols

Al_2O_3	chemical symbol for aluminium oxide
As	chemical symbol for arsenic
CaO	chemical symbol for calcium oxide or quicklime
Co	chemical symbol for cobalt
CO_2	chemical symbol for carbon dioxide
Cr_2O_3	chemical symbol for chromium (III) oxide
Cu	chemical symbol for copper
Fe	chemical symbol for iron
Fe_2O_3	chemical symbol for haematite
Fe_3O_4	chemical symbol for magnetite
FeO	chemical symbol for Iron Oxide
H_2O	chemical symbol for water
K_2O	chemical symbol for potassium oxide
MgO	chemical symbol for magnesia or magnesium oxide
MnO	chemical symbol for manganese oxide
Na_2O	chemical symbol for sodium oxide
Ni	chemical symbol for nickel
P	chemical symbol for phosphorous
P_2O_5	chemical symbol for phosphorus pentoxide
Pb	chemical symbol for lead
S	chemical symbol for sulphur; non-metallic native element
SiO_2	chemical symbol for silica
SO_3	chemical symbol for sulphur trioxide
TiO_2	chemical symbol for titanium dioxide
V_2O_3	chemical symbol for vanadium trioxide

V^2O_5	chemical symbol for vanadium pentoxide
Zn	chemical symbol for zinc
Σ	Greek letter Sigma, used to represent a summation of values

Technical Terms

"A" (reserve classification under the Russian System)	Category A resources, where the reserves in place are known in detail. The boundaries of the deposit have been outlined by trenching, drilling, or underground workings. The quality and properties of the ore are known in sufficient detail to ensure the reliability of the projected exploitation.
"acid"	an igneous or volcanic rock containing more than about 60% silica (SiO_2) by weight
"acid rock drainage"	drainage that occurs as a result of natural oxidation of sulphide minerals contained in rock that is exposed to air and water
"actinolite"	a monoclinic mineral, $2[Ca_2(Mg,Fe)_5Si_8O_{22}(OH)_2]$; a metamorphic ferromagnesian mineral; an asbestos
"adit"	a horizontal or sub-horizontal underground development providing access to underground workings from surface
"aero-magnetic"	a geophysical prospecting (by air) method that maps variations in the magnetic field of the Earth that are attributable to changes of structure or magnetic susceptibility in certain near-surface rocks
"alteration"	changes in the chemical or mineralogical composition of a rock, generally produced by weathering or hydrothermal solutions
"ammine"	one of a group of complex compounds formed by coordination of ammonia molecules with metal ions
"amsl"	above mean sea level
"aplite"	light-coloured igneous rock characterised by a fine-grained texture
"andesite" or "andesitic"	fine-grained igneous rock with no quartz or orthoclase, composted of about 75% plagioclase feldspars, balance ferromagnesian silicates
"apatite"	any hexagonal or monoclinic pseudohexagonal mineral, $Ca_5(F,C_1)(PO_4)_3$; found in igneous rocks and metamorphosed limestone's; main source of phosphates
"argillite"	compact rock, derived either from mudstone or shale (argillic)
"arsenopyrite"	arsenic mineral; FeAsS; usually found in hydrothermal veins
"assay"	to test an ore or mineral for composition, purity, weight, or other properties of commercial interest

"auger"	tool designed for boring holes into soil or soft/weak rock
"autogenous"	a. in the dense-media separation process, fluid media partly composed of a mineral species selected from material being treated; b. selectively sized lumps of material used as grinding media
"B" (reserve classification under the Russian System)	Category B reserves, where the reserves in place have been explored but are only known in fair detail. The boundaries of the deposit have been outlined by trenching, drilling, or underground workings. The quality and properties of the ore are known in sufficient detail to ensure the basic reliability of the projected exploitation.
"Banka drill"	portable, manually operated system used in prospecting alluvial deposits to depths of 50ft (15m) or more. Also known as an Empire drill
"basalt"	fine-grained igneous rock dominated by dark-coloured minerals, consisting of plagioclase feldspars (over 50%) and ferromagnesian silicates
"Banded Iron Formation" or "BIF"	iron formation that shows marked banding, generally of iron rich minerals and chert or fine grained quartz
"Bankable Feasibility Study" or "BFS"	a comprehensive design and costing study of the selected option for the development of a mineral project in which appropriate assessments have been made of realistically assumed, geological, mining, metallurgical, economic, marketing, legal, environmental, social governmental, engineering, operational and all other modifying factors which are considered in sufficient detail to demonstrate at the time of reporting (i) that extraction is reasonably justified (economically mineable) and (ii) the factors finance the development of the project.
"basement"	oldest rocks exposed in an area
"beneficiate" or "beneficiation"	to improve the grade by removing associated impurities; preparation of ores for smelting by drying, flotation or magnetic separation
"berm"	horizontal shelf or ledge built into the embankment or sloping wall of an open pit to break the continuity of an otherwise long slope and to strengthen its stability or to catch and arrest slide material
"biotite"	ranging in colour from dark brown to green. Rock-forming ferromagnesian silicate mineral with tetrahedra in sheets; monoclinic mineral (mica), $K_2Mg_6(Si_6Al_2O_{20})(OH,F)_2$; mica group
"bgl"	below ground level
"bmsl"	below mean sea level

"borehole"	hole with a drill, auger, or other tool for exploring strata
"breccia"	clastic rock made up of poorly sorted angular fragments of such size that an appreciable percentage of rock volume consists of particles of granule size or larger
"C_1" (reserve classification under the Russian System)	Category C_1 reserves, where the reserves in place have been estimated by a sparse grid of trenches, drillholes or underground workings. This category also includes reserves adjoining the boundaries of A and B reserves as well as reserves of very complex deposits in which the distribution cannot be determined even by a very dense grid. The quality and properties of the deposit are known tentatively by analyses and by analogy with known deposits of the same type. The general conditions for exploitation are known tentatively.
"C_2" (reserve classification under the Russian System)	Category C_2 reserves, where the reserves have been extrapolated from limited data, probably only a single hole. This category includes reserves that are adjoining A, B, and C_1 reserves in the same deposit
"calcite"	a trigonal mineral, or the mineral group; composed of calcium carbonate, $CaCO_3$
"Caledonian"	major mountain building episode which took place during the lower Palaeozoic Era
"Cambrian"	a period of geologic time from about 590 to 505Ma
"CAPEX"	Capital expenditure
"carbonate"	refers to a carbonate mineral such as calcite
"Carboniferous"	a period of geologic time from about 345 to 280Ma
"chalcedony"	fibrous cryptocrystalline silica with waxy lustre; deposited from aqueous solutions and frequently found lining or filling cavities in rocks
"chalcopyrite"	the mineral sulphide of iron and copper, CuFeS
"channel sample"	continuous rock samples, where an even channel is cut into the rock to obtain the sample. If competently sampled, the quality of such sampling is comparable to drill-hole assays
"chert"	cryptocrystalline silica which may be of organic or inorganic origin
"chlorite"	tetrahedral sheet silicates of iron, magnesium, and aluminium, characteristic of low-grade metamorphism; green colour
"chloritisation"	alteration of rocks to chlorite as a result of low-grade metamorphism
"clastic"	consisting of fragments of minerals, rocks or organic structures that have been moved individually from their place of origin

"concentrate"	the clean product recovered from a treatment plant
"concession"	a grant of mining rights especially by a government in return for services or for a particular use
"conglomerate"	generally coarse grained rock with rounded or sub-rounded clasts that are greater than 2mm in size
"Cretaceous"	a period of geologic time from about 144 to 65Ma
"cut-off grade" or "C.O.G"	lowest grade of mineralised material considered economic, used in the calculation of Mineral Resources and Ore Reserves. Mineral Resources are reported to a specific cut-off grade which takes into account both the economic viability of future mining operations and the geological continuity of the mineralisation which may or may not reflect natural geological and structural boundaries. Ore Reserves are estimated on the basis of an economic cut-off grade which is calculated based on current metal prices and the estimated costs of exploitation of the mineralised material
"Davis Tube"	laboratory scale test to determine the proportion of iron recoverable through magnetic separation
"deposit"	mineral deposit or ore deposit is used to designate a natural occurrence of a useful mineral, or an ore, in sufficient extent and degree of concentration
"diabase"	metamorphosed medium-grained igneous rock
"Digital Terrain Model" or "DTM"	a 3-Dimensional model of a surface, such as topography or the top of a seam
"dip"	the true dip of a plane is the angle it makes with the horizontal plane
"diorite"	coarse-grained igneous rock with composition of andesite (no quartz or orthoclase), composed of 75% plagioclase feldspars and balance ferromagnesian silicates
"diamond drilling"	drilling method which obtains a cylindrical core of rock by drilling with an annular bit impregnated with diamonds
"Direct Reduction" or "DR"	an alternative route of iron making developed to overcome some of the difficulties of conventional blast furnaces
"downthrow"	a fault that displaces the strata downward relative to the workings approaching it
"DRI"	an abbreviation of "Direct Reduced Iron"
"drill hole"	hole in rock or other material made by a rotational and downward force, to recover a sample of the material
"drive"	a horizontal underground tunnel
"dyke"	a sheet like body of igneous rock which is discordant
"EA"	Environmental Assessment

"EHSC"	Environmental, Health and Safety Community
"EHSIA"	Environmental Health and Social Impact Assessment
"EIA"	Environmental Impact Assessment
"EMP"	Environmental Management Plan
"EPCM"	Engineering, Procurement and Construction Management
"epidote"	silicate of aluminium, calcium, and iron characteristic of low-grade metamorphism
"epithermal"	hydrothermal mineral deposit formed within about 1km of the Earth's surface and in the temperature range of 50 to 200°C, occurring mainly as veins; also said of that depositional environment
"exploration"	method by which ore deposits are evaluated
"extrusive"	igneous rock that has been erupted onto the surface of the Earth; extrusive rocks include lava flows and pyroclastic material such as volcanic ash
"fault"	surface of rock fracture along which has been differential movement
"Fe"	chemical symbol for iron (total Fe content)
"Fe_{Eq}"	the titanium dioxide element of the reserve and resource estimate is converted for the sake of clarity in this publication to an 'iron equivalent' using a market ratio of 41.56:70. This ratio represents the current ex-mine selling prices of iron ore concentrate and ilmenite respectively. WAI considers these prices to be reasonable at the time of presenting this report
"Fe_{sol}"	amount of Fe that can be dissolved in a given amount of solvent
"Fe_{total}"	total amount of iron content
"feasibility study"	an extensive technical and financial study to assess the commercial viability of a project
"feldspar"	most important group of rock forming silicate minerals, with end-members, alkali feldspar $KAlSi_2O_8$, sodium feldspar $NaAlSi_2O_8$ and calcium feldspar $CaAlSi_2O_8$
"FeO_2"	iron oxide
"ferromagnesium"	silicate minerals containing iron and/or magnesium
"ferruginous"	pertaining to or containing iron
"FGS"	Fellow of the Geological Society
"FIMMM"	Fellow of the Institute of Material, Mining and Metallurgy
"filtration"	removal of suspended and/or colloidal material from a liquid by passing the suspension through a relatively fine porous medium

"fines"	finely crushed or powdered material; term for particles less than 0.074mm
"flexure"	general term for a fold, warp, or bend in rock strata
"float"	general term for loose fragments of ore or rock, esp. on a hillside below an outcropping ledge or vein
"flocculation"	process by which a number of individual, minute suspended particles are tightly held together in clot-like masses
"flotation"	a mineral process used to separate mineral particles in a slurry, by causing them to selectively adhere to a froth and float to the surface
"flowsheet"	diagram showing progress of material or ore through a preparation or treatment plant
"fold"	bend, flexure, or wrinkle in rock produced when rock was in a plastic state
"footwall"	rock mass below a fault, vein, bed or mineralisation
"gabbro"	coarse-grained igneous rock with composition of basalt
"galena"	lead sulphide, chemical symbol PbS; principal ore of lead
"gangue"	rocks and minerals of no economic value that occur with valuable minerals in an ore
"Gauss"	unit of magnetic induction in the electromagnetic and Gaussian systems of units
"geologic block"	the defined boundaries of an ore resource
"geochemical"	prospecting techniques which measure the content of specified metals in soils and rocks; sampling defines anomalies for further testing
"geophysical"	prospecting techniques which measure the physical properties (magnetism, conductivity, density, etc.) of rocks and define anomalies for further testing
"geostatistics"	complex method of resource estimation using regionalised variables i.e., grade and thickness
"geotechnical"	referring to the use of scientific methods and engineering principles to acquire, interpret, and apply knowledge of earth materials for solving engineering problems
"gneiss"	banded metamorphic rock with gneissic cleavage (parting); commonly formed by metamorphism of granite
"GPS"	Global Positioning System; satellite-based navigational system permitting the determination of any point on the Earth with high accuracy

"graben"	a downthrown block between two parallel faults
"grade"	relative quantity or the percentage of ore mineral or metal content in an ore body
"granite"	coarse-grained igneous rock dominated by light-coloured minerals, consisting of about 50% orthoclase, 25% quartz, and balance of plagioclase feldspars and ferromagnesian silicates
"granodiorite"	coarse-grained igneous rock intermediate in composition between granite and diorite
"greenschist"	schistose metamorphic rock whose green colour is due to the presence of chlorite, epidote or actinolite
"greenschist facies"	assemblage of minerals formed between 150 and 250°C during regional metamorphism
"greenstone belt"	field term applied to a band or zone of any compact dark-green altered or metamorphosed basic igneous rock
"greywacke"	variety of sandstone generally characterized by hardness, dark colour, and angular grains of quartz, feldspar, and small rock fragments set in matrix of clay-sized particles
"grizzly"	device comprised of fixed or moving bars, disks, or shaped tumblers or rollers for the coarse screening or scalping of bulk materials
"grunerite"	monoclinic mineral, chemical formula $(Fe,Mg)_7Si_8O_{22}(OH)_2$; characteristic of some iron deposits
"halo"	circular or crescent distribution pattern about the source or origin of a mineral
"hanging wall"	rock mass above a fault, vein, bed or mineralisation, or an ore deposit
"haematite"	an iron mineral with the formula Fe_2O_3; found as an accessory in igneous rocks, in hydrothermal veins and replacements, and in sediments
"hornblende"	mineral of the amphibole group; $NaCa_2(Mg,Fe)_4(Al,Fe)(Si,Al)O_{22}(OH,F)_2$; widespread in metamorphic rocks
"hydraulic mining"	use of strong water jet to move deposits of sand and gravel from original site to separating equipment, where sought-for mineral is extracted
"hydrogeology"	the study of the water cycle that deals with the distribution and movement of groundwater in the soil and rocks
"hydrothermal"	refers in the broad sense to the process associated with alteration and mineralization by a hot mineralised fluid (water)

"hypogene"	formed or crystallised at depths below the earth's surface; said of granite, gneiss, and other rocks
"igneous"	rock or mineral that solidified from molten or partly molten material, i.e., from a magma
"ilmenite"	iron titanium oxide; a trigonal mineral, chemical formula $FeTiO_3$
"*Indicated* Resource"	as defined in the JORC Code, is that part of a Mineral Resource which has been sampled by drill holes, underground openings or other sampling procedures at locations that are too widely spaced to ensure continuity but close enough to give a reasonable indication of continuity and where geoscientific data are known with a reasonable degree of reliability. An Indicated Mineral Resource will be based on more data and therefore will be more reliable than an Inferred resource estimate
"indurator"	a kiln used in the pellet making process which bakes and hardens the raw or "green" pellets which enables them to be transported
"*Inferred* Resource"	as defined in the JORC Code, is that part of a Mineral Resource for which the tonnage and grade and mineral content can be estimated with a low level of confidence. It is inferred from the geological evidence and has assumed but not verified geological and/or grade continuity. It is based on information gathered through the appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes which may be limited or of uncertain quality and reliability
"intermediate"	the composition of igneous or volcanic rocks whose composition lies between those of basic and acid rocks
"intrusive"	of or pertaining to intrusion — both the processes and the rock so formed
"IPD^2" or "Inverse Power Distance Squared"	A method for interpolating spatial sample data and determining values between data points.
"IOM_3" or "IMMM"	Institute of Materials, Minerals and Mining
"island arc"	group of islands having a curving, arc like pattern
"jamesonite"	ore mineral of lead antimony sulphide
"jarosite"	trigonal mineral, chemical formula $KFe_3(SO_4)_2(OH)_6$
"jasper"	red chert-like variety of chalcedony (silica group)
"jaspilite"	interbedded jasper and iron oxides
"Joint Venture" or "JV"	contractual agreement joining together two or more parties for the purpose of executing a particular business undertaking. All parties agree to share in the profits and losses of the enterprise

"JORC Code"	Joint Ore Reserve Committee of the Australian Institute of Mining and Metallurgy; for reporting of Mineral Resources and Ore Reserves which sets out the minimum standards, recommendations and guidelines for the public reporting of exploration results, Mineral Resources and Ore Reserves
"kriging"	A geostatistical technique for interpolation that takes account of the spatial auto-correlation of a variable (e.g. metal grade) to produce the best linear unbiased estimate
"l/s"	litres per second — a measure of volumetric flow
"leachate"	solution obtained by leaching
"limb"	area of a fold between adjacent fold hinges
"LIMS"	low intensity magnetic separation
"lineament"	a large scale linear structural feature
"MACs"	Maximum Allowable Concentration
"MADs" (or "MPD")	Maximum Allowable (or Permissable) Discharge
"MAEs"	Maximum Allowable Emission
"mafic"	Pertaining to or composed dominantly of the ferromagnesian rock-forming silicates; said of some igneous rocks and their constituent minerals
"malachite"	monoclinic mineral, $Cu_2CO_3(OH)_2$; bright green; occurs with azurite in oxidized zones of copper deposits
"mafic"	a dark-coloured igneous rock which has a high proportion of pyroxene and olivine minerals
"mangenite"	monoclinic mineral, MnO(OH); a hydrothermal vein mineral; an ore of manganese
"magnetite"	isometric mineral, $8[FeOFe_2O_3]$; major mineral in banded iron formations
"manganese"	grey-white, hard, brittle metallic element; chemical symbol Mn
"massive"	a. said of a mineral deposit characterised by a great concentration of ore in one place, as opposed to a disseminated or vein deposit. b. said of any rock that has a homogeneous texture or fabric over a wide area, with an absence of layering, foliation, cleavage, or any similar directional structure
"*Measured* Resource"	defined in the JORC Code, as that part of a Mineral Resource for which the resource has been intersected and tested by drill holes, underground openings or other sampling procedures at locations which are spaced closely enough to confirm continuity

	and where geoscientific data are reliably known. A measured resource estimate will be based on a substantial amount of reliable data, interpretation and evaluation which allows a clear determination to be made of the shapes, sizes, densities and grades
"meta"	prefix that indicates that the rock has been metamorphosed
"metallogenic"	study of the genesis of mineral deposits, with emphasis on its relationship in space and time to regional petrographic and tectonic features of the Earth's crust
"metallogenic province"	a belt of rocks, often structurally controlled, that are host to a specific selection of minerals
"metallurgical"	describing the science concerned with the production, purification and properties of metals and their applications
"metamorphism"	process by which rocks which have been altered by the agencies of heat, pressure and chemically active fluids
"metasomatism"	metamorphic change which involves the introduction of material from an external source
"mica" or "micaceous"	group of phyllosilicate minerals, plate or sheet grain shape; containing mica
"mill"	equipment used to grind crushed rocks to the desired size for mineral extraction
"Mineral Resource"	concentration or occurrence of material of intrinsic economic interest in or on the Earth's crust in such a form that there are reasonable prospects for the eventual economic extraction. The location, quantity, grade geological characteristics and continuity of a Mineral Resource are known, estimated or interpreted from specific geological evidence and knowledge. Mineral Resources are sub-divided into *Inferred*, *Indicated* and *Measured* categories
"mineralisation"	process of formation and concentration of elements and their chemical compounds within a mass or body of rock
"moraine"	mound, ridge, or other distinct accumulation of unsorted, unstratified glacial drift, predominantly till, deposited chiefly by direct action of glacier ice
"NPV"	Net Present Value
"open-pit"	a large scale hard rock surface mine; mine working or excavation open to the surface
"OPEX"	operating expenditure
"ophiolitic"	said of mafic and ultramafic igneous rocks, including rocks rich in serpentine, chlorite, epidote, and albite derived from them by later metamorphism

"optimisation"	co-ordination of various mining and processing factors, controls and specifications to provide optimum conditions for technical/ economic operation
"Ordinary Kriging" or "OK"	A variety of kriging which assumes that local means are not necessarily closely related to the population mean, and which therefore uses only the samples in local neighbourhood for the estimate (see *kriging*).
"ore"	material from which a mineral or minerals of economic value can be extracted profitably or to satisfy social or political objectives
"ore-field"	a zone of concentration of mineral occurrences
"ore body"	mining term to define a solid mass of mineralised rock which can be mined profitably under current or immediately foreseeable economic conditions
"Ore Reserve"	economically mineable part of a *Measured* or *Indicated* Mineral Resource. It includes diluting materials and allowances for losses which may occur when the material is mined. Appropriate assessments, which may include feasibility studies, have been carried out, and include consideration of and modification by realistically assumed mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors. These assessments demonstrate at the time of reporting that extraction could be reasonably justified. Ore Reserves are sub-divided in order of increasing confidence into *Probable* and *Proven*
"orogenic"	mountain building
"outcrop"	part of a rock formation that appears at the surface of the ground
"P_1" (reserve classification under the Russian System)	category P_1 resources, where resources may extend outside the actual limits of the Ore Reserves defined in the C_2 category. The outer limits of P_1-type resources are determined indirectly by extrapolating from similar known mineral deposits in the area. P_1 is the main source from which C_2 reserves can be increased.
"P_2" (reserve classification under the Russian System)	category P_2 resources where these resources represent possible mineral structures in known mineral deposits or ore-bearing regions. They are estimated based on geophysical and geochemical data. Morphology, mineral composition and size of the orebody are estimated by analogy with similar mineralised geologic structures in the area.
"P_3" (reserve classification under the Russian System)	any potential ore-bearing deposits are classified as resources in the P_3 category. The presence of these resources relies on the theoretical definition of a "favourable geological environment". Resource figures are derived from figures of similar deposits in the region.

"Paleozoic Era"	the first of the three eras of the Phanerozoic, spanning 570 to 248Ma
"paragenesis"	the relationship of minerals expressed in terms of a time sequence
"parasitic"	fold of small wavelength and amplitude which usually occurs in a systematic form superimposed on folds of larger wavelength
"pellet"	a small spherical marble-sized ball of iron ore used in steelmaking
"Phanerozoic"	rocks younger than 590Ma
"Pilot Plant"	small scale processing plant in which representative tonnages of ore can be tested under conditions which foreshadow full-scale operation proposed
"plagioclase"	any of a group of feldspars containing a mixture of sodium and calcium feldspars
"plutonic"	pertaining to igneous rocks formed at great depths
"phyllite"	a fine grained low-grade metamorphic rock
"planimeter"	an instrument for measuring the area of any plane figure by passing a tracer around its boundary line
"plunge"	a fold is said to plunge if the axis is not horizontal
"POL"	Place Of Lode from surface—i.e., the distance of the mean elevation of an ore body from the surface of the earth.
"polymetallic"	refers to a mineral deposit or occurrence with several metal sulphides, common metals include Cu, Pb, Fe, Au and Ag
"porphyry"	igneous rock containing conspicuous phenocrysts (crystals) in fine-grained or glassy groundmass
"porphyritic"	a medium-coarse grained intrusive or volcanic rock which is conspicuous by containing more than 25% large well-formed crystals by volume
"Precambrian"	the geological era from the consolidation of the Earths crust to the base of the Cambrian; older than 570Ma
"precious metal"	gold, silver and platinum group minerals
"preliminary feasibility study"	a comprehensive study of the viability of a mineral project that has advanced to a stage where the mining method, in the case of underground mining, or the pit configuration, in the case of an open pit, has been established, and where an effective method of mineral processing has been determined. This study must include a financial analysis based on reasonable assumptions of technical, engineering, operating and economic

	factors and evaluation of other relevant factors which are sufficient for a qualified person acting reasonably, to determine if all or part of the Mineral Resource may be classified as a mineral reserve
"primary"	characteristic of or existing in a rock at the time of its formation; pertains to minerals, textures etc.; original
"processing"	methods employed to clean, process and prepare materials or ore into the final marketable product
"propylitic"	plagioclase in an igneous rock is altered to epidote, sericite and secondary albite, and ferro-magnesian minerals are altered to chlorite-calcite-epidote-iron oxide assemblages
"Proterozoic"	the most recent of three sub-divisions of the Precambrian, spanning 2,500 to 570Ma
"primary ore"	ore that has remained practically unchanged from the time of original formation and being in-situ
"psilomelane"	general term for massive oxides of manganese not otherwise identified
"pyrite"	an iron sulphide mineral with the chemical formula FeS_2
"pyroclastic"	produced by explosive or aerial ejection of ash, fragments, and glassy material from a volcanic vent
"pyrolusite"	tetragonal mineral, MnO_2; source of manganese
"pyrrhotite"	monoclinic and hexagonal mineral, chemical formula FeS; iron sulphide; commonly associated with nickel minerals
"pyroxene"	group of rock forming silicates
"QA/QC"	Quality Assurance/Quality Control; Systematic setting, check, and operation designed to maintain steady working conditions in continuous process such as mineral concentration; to forestall trouble; to check condition of ore, pulp, or products at important transfer points
"QQ plot"	plot for comparing two probability distributions, usually the sample distribution function and a theoretical distribution function
"quartz"	a trigonal mineral, chemical symbol SiO_2; silica group of minerals
"recovery"	proportion of valuable material obtained in the processing of an ore, stated as a percentage of the material recovered compared with the total material present
"recumbent"	overturned fold, the axial surface of which is horizontal or nearly so

"Red Book"	a Russian State document established to record rare and endangered species of animals, plants and fungi that exist within the territory of the Russian Federation
"rhyolite"	a fine-grained extrusive igneous rock, often with a sugary texture, consisting of essential quartz, alkali feldspar and one or more ferromagnesian minerals
"rock chip"	a chip sample taken from one or more points within a restricted area
"run-of-mine" or "ROM"	recovered ore, as mined with dilution, before any pre-concentration or other form of processing
"sandstone"	detrital sedimentary rock in which particles range from 1/16 to 2mm
"schist"	metamorphic rock dominated by fibrous or platy minerals
"sedimentary"	rocks formed from material derived from pre-existing rocks by processes of denudation
"sericite"	white, fine-grained potassium mica occurring in small scales as an alteration product of various aluminosilicate minerals
"SG" or "specific gravity"	ratio between weight of given volume of material and weight of equal volume of water
"shaft"	vertical or inclined excavation into mine workings
"siderite"	iron carbonate, chemical formula $FeCO_3$; an ore of iron
"silica"	chemically resistant dioxide of silicon
"siliceous"	of, relating to, or derived from silica
"silicification"	the introduction of silica into a rock, either filling pore spaces or replacing pre-existing minerals
"siltstone"	detrital sedimentary rock in which particles are less than 1/16mm
"Silurian"	a period of geologic time from about 435 to 395Ma
"sinter"	process for agglomerating ore concentrate in which partial reduction of minerals may take place and some impurities may be expelled prior to subsequent smelting and refining
"skarn"	thermally metamorphosed impure limestone (or dolomite) in which metasomatism has also occurred
"slurry"	particles concentrated in a portion of circulating water to form fluid
"stratigraphic"	pertaining to the composition sequence, and correlation of stratified rocks (formed, arranged, or laid down in layers)

"stratiform"	deposit in which the desired rock or ore constitutes one or more sedimentary, metamorphic or igneous layer
"strike"	the longest horizontal dimension of an ore body or zone of mineralisation
"stripping ratio" or "SR"	a ratio of the waste relative to ore in a mining operation
"sub-volcanic"	pertaining to an igneous intrusion, or to the rock of that intrusion, whose depth is intermediate between that of abyssal or plutonic and the surface
"sulphide"	mineral containing sulphur in its non-oxidised form
"syncline"	a basin shaped fold
"synform"	fold whose limbs close downward in strata for which the stratigraphic sequence is unknown
"tailings"	material that remains after all metals/minerals considered economic have been removed from the ore
"tectonic"	an adjective used to relate a particular phenomenon to a structural or orogenic concept, e.g. tectonic control of sedimentation
"tectono-magmatic"	structural and intrusive history of an area
"Tertiary"	a period of geologic time from about 2 to 65Ma
"TMF"	Tailings Management Facility
"tonalite"	alternative name for diorite
"treatment plant"	a plant where ore undergoes physical or chemical treatment to extract the valuable metals/minerals
"trench sampling"	sampling of a trench cut through the rock, generally in the form of a series of continuous channels (*channel samples*)
"tuff"	rock consolidated from volcanic ash
"tuffaceous"	said of sediments containing up to 50% tuff
"ultramafic"	an igneous rock composed chiefly of mafic minerals
"variography"	a geostatistical method of determining the spatial variations in the grade and nature of mineralisation within a particular ore body
"vein"	a tabular deposit of minerals occupying a fracture, in which particles may grow away from the walls towards the middle
"weathering"	the breakdown of rocks and minerals in the near-surface environment by the action of physical and chemical processes, in the presence of air and water
"WHIMS"	wet high intensity magnetic separation