1.0 INTRODUCTION

This Pre-Feasibility Report (PFR) has been prepared as part of the application for grant of Terms of Reference (ToR) for carrying out Environmental Impact Assessment and Environmental Management (EIA/EMP) studies for the proposed Rohil Uranium Project of Uranium Corporation of India Ltd. (UCIL).

The project has been envisaged to ensure continuous & sustained supply of uranium to meet different requirements including strategic requirements. UCIL has already taken up the work of exploration at Rohil deposit of Khandela Tehsil, District-Sikar of Rajasthan.

The project envisages development of Rohil Uranium complex for 0.75 million TPA.

Around 1300 ha land will be required for installation of mining and processing plant including tailing pond & township having 2500 dwelling units inside the mines complex. The project area is located in Khandela Tehsil, District-Sikar of Rajasthan. The estimated mineable reserves of Rohil central block is sufficient for 15 years. Reserve and ore grade is classified information under Atomic Energy Act 1962.

In pursuance of Government of India policy vide Environment (Protection) Act, 1986 new projects or expansion of any existing plant necessitates statutory prior Environmental Clearance in accordance with the objectives of National Environmental Policy as approved by the Union Cabinet on 18th May, 2006 and MoEF's EIA Notification dated 14.09.2006, by preparing a EIA / EMP report. As part of the process of scoping for the EIA / EMP studies the project proponent has to submit an online formal application to MoEFCC in the prescribed format (Form I) along with a Pre Feasibility Report.

AMD discovered Rohil uranium deposit in Sikar district of Rajasthan in 1953-54. Presently, Rohil deposit is under exploration by AMD from 1997. Application has been made to Rajasthan Government for granting of lease. Feasibility report of the envisaged project has already been prepared by MECON.

UCIL has decided to submit an application for environmental clearance to MoEFCC and has engaged the services of MECON Limited a Public Sector Undertaking under the Ministry of Steel, Govt. of India to prepare a Pre-Feasibility Report as the first step for seeking Environmental Clearance for the Tummalapalle Uranium Ore mine.

This report contains information on the proposed project. The report including this introduction chapter includes:

- Introduction of the Project / Background Information
    - *Identification of the Project and the Project Proponent*
    - *Brief Information of the Project*

  - *Need for the Project and its Importance to the Country or Region*
  - *Demand and Supply*
  - *Import vs. Indigenous Production*
  - *Export Possibilities*
  - *Domestic / Export Market*
  - *Employment Generation*

- Project Description
  - *Type of Project including Interlinked and Interdependent Project*
  - *Location*
  - *Details of Alternate Site*
  - *Size and Magnitude of Operation*
  - *Mine Description*
  - *Raw Materials*
  - *Resource Optimization / Recycling and Resource*
  - *Site Services*
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- Site Analysis
  - *Connectivity*
  - *Land Form, Land Use, Ownership*
  - *Land use*
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  - *Climate*
  - *Social infrastructure available*

- Planning Brief
  - *Planning Concept*
  - *Land Use Planning*
  - *Assessment of Infrastructure Demand*
  - *Amenities / Facilities*

- Proposed infrastructure
- Resettlement and Rehabilitation Plan
- Project Schedule and Cost Estimate
- Analysis of Proposal (Final Recommendation)

ACKNOWLEDGEMENT

MECON wishes to place on record its deep appreciation for the trust reposed in MECON by UCIL and for the active interest and help extended by UCIL officials.

2.0 INTRODUCTION OF THE PROJECT / BACKGROUND INFORMATION:

2.1 IDENTIFICATION OF PROJECT AND PROJECT PROPONENT:

Uranium Corporation of India Limited (UCIL) is a Public Sector Enterprise under the Department of Atomic Energy incorporated on 4th October 1967. UCIL is at the forefront of the Nuclear Power cycle.

UCIL's existing operations are spread over Jharkhand and Andhra Pradesh. UCIL is operating seven underground mines (Jaduguda, Bhatin, Bagjata, Turamdih, Narwapahar and Mohuldih in Jharkhand and Tummalapalle in Andhra Pradesh). UCIL also owns one opencast mine at Banduhurang in Jharkhand, which is the first and so far the only opencast uranium mine in India. UCIL also operates uranium ore processing plants at Jaduguda and Turamdih in Jharkhand and Tummalapalle in Andhra Pradesh to extract the uranium present in the ore. The uranium present in the ore is extracted as Uranium peroxide (at the Jaduguda and Turamdih plants) or as sodium-di-uranate (in the Tummalapalle plant) also known as "Yellow Cake". The yellow cake is dispatched to Nuclear Fuel Complex, Hyderabad for further processing.

The project area comprises of agricultural land and barren land.

AMD discovered Rohil uranium deposit in Sikar district of Rajasthan in 1953-54. Presently, Rohil deposit is under exploration by AMD from 1997. The project envisages production of 0.75 million TPA uranium ore from underground uranium mine. Besides, 0.75 million TPA uranium processing complex (Mill) has also been proposed to be installed nearby the mines to produce uranium cake from the ore. The estimated project cost is Rs. 3000 crores. The overall life of the operations is expected to 15 years.

2.2 BRIEF INFORMATION OF THE PROJECT:

The project falls under Category 'A' [Sl.no. 1(a) and 2(b) of Schedule: "List of project or activities requiring prior Environmental Clearance"] of MoEFCC notification dated 14th September, 2006, Amendment Nov.-2009 & April -2011 of the Ministry of Environment & Forest, New Delhi.

Peak industrial water demand for the envisaged project has been estimated to be 4000 m^3/day which shall be met by STP treated water from Sikar District, whereas potable water demand has been estimated to be 100 m^3/day which shall be met from Khandela.

2.3 NEED FOR THE PROJECT AND ITS IMPORTANCE TO THE COUNTRY OR REGION:

Nuclear power generation in India has been planned to be increased from 4560 MWe at present to 20,000 MWe by the year 2020. This will lead to increased demand for uranium. Consequently, UCIL plans to increase the production capacity from its existing mines and also develop new mines. Expansion of Tummalapalle mine is part of this programme to facilitate the increased demand of uranium for India's nuclear power industry.

Opening of Rohil Uranium Mine will have the following benefits:

- Increase supply of uranium ore for India's nuclear power programme.
- Alternative for reducing coal dependency.
- Reduces power shortages hindering growth, foreign investment and productivity.
- Generate additional employment, both direct and indirect which will lead to economic growth of the industrial sector as well as country.
- Quality of life of local populace in villages shall improve due to company's community development programmes.

2.4 DEMAND AND SUPPLY GAP:

India's atomic energy programme, in spite of opportunities for import of fuel shall continue to prefer the ideal path of generating power using indigenous uranium. But, demand of fuel for nuclear reactor is not fully met by indigenous uranium. At present with 4780 MW of installed nuclear power capacity, about 32% of fuel requirement is met by imported uranium. With addition of more nuclear power reactors, demand and supply gap of uranium is likely to increase.

In the last four decades, the Indian uranium industry has established mining and processing capacity of 5,500 TPD ore which is likely to go up to 12,000 TPD by 2015. The grade of uranium ore in India being low, inevitable efforts to mine and process progressive lower grade ore does not record matching rise in uranium production capacity.

Indian uranium deposits are of medium size and the country has a modest uranium resource. Only a small part of the land mass of the total of 3.28 million sq.km of Indian sub-continent is assumed to be geologically favorable for hosting uranium deposits. Of the total uranium resources identified so far, Jharkhand accounts for about 45%, And Andhra Pradesh 26%, Meghalaya 16%, Rajasthan and Karnataka 4% each and remaining in other states.

Successful implementation of indigenously developed processing technology at Tummalapalle holds the key for larger expansion programme of uranium production capability in this area.

The technologies to mine thin and low grade ore, benchmark of zero discharge, higher and purer product recovery, disposal and management of large tailings, public perception on uranium mining, availability of skilled manpower etc are crucial for indigenous uranium production scenario in coming decades.

2.5 IMPORT VS INDIGENOUS PRODUCTION:

Refer clause 2.4 above.

2.6 EXPORT POSSIBILITIES:

Uranium produced from this project will be exclusively consumed in the domestic power generation. There is no proposal for export of uranium ore from this project.

2.7 DOMESTIC / EXPORT MARKET:

There is no possibility of domestic and export market for uranium ore supply.

2.8 EMPLOYMENT GENERATION:

The envisaged project will employ a total of 2500 people.

Description	Executives	Non Executives	Contract workers
Mines	50	950	200
Mill	65	485	250
Services	50	150	300
Total	**165**	**1585**	**750**

Majority of the unskilled and semi-skilled workers will be local persons. The officers, supervisors and rest of the workers will be housed in UCIL's proposed townships. However, this may vary depending on the mode of execution of the projects and operations (departmental or outsourcing).

3.0 PROJECT DESCRIPTION

It has been planned to develop Rohil uranium deposit and carry out mining & processing activities. It has been proposed to develop Rohil Uranium Complex for 0.75 million TPA from underground activity. Estimated project cost of the envisaged project is Rs. 3000 crore. The project area will consist of total 1300 ha.

3.1 TYPE OF PROJECT INCLUDING INTERLINKED AND INTER-DEPENDENT PROJECT

The project falls under Category 'A' [Sl.no. 1(a) and 2 (b) of Schedule: "List of project or activities requiring prior Environmental Clearance"] of MoEFCC notification dated 14th September, 2006 in connection with Environment (Protection) Rules 1986.

3.2 LOCATION:

Rohil Uranium deposit is located in Sikar district (27° 33' 25" N Latitude and 75° 29' 25" E Longitude) of Rajasthan is under exploration by AMD since 1997 after identification of geophysical anomalies. Entire area for exploration (1500m x 250m) was divided into three blocks. The project area has been envisaged over 1300 ha in Khandela Tehsil of Sikar District.

The site is 120 Km NW of Jaipur and falls under Khandela Tehsil. The deposit is well connected by road through NH 11 from Jaipur to Palsana (85 km), state highway from Palsana to Khandela (20 km) and further about 4 km metalled road from Khandela to Rohil. The deposit lies in Survey of India toposheet no. 45 M/6. The general surface elevation of the area of the deposit varies from 485-500m.

3.3 DETAILS OF ALTERNATE SITE:

Since the project envisages an underground mine and ore processing complex and mining is a site specific activity guided by deposit geology, the question of any alternate site does not arise.

3.4 SIZE AND MAGNITUDE OF OPERATION:

The project area is proposed to develop over 1300 ha. The existing rated capacity of the mine will be 0.75 million TPA of uranium ore. The proposal envisages development of Rohil Uranium Complex consisting of mining & processing of uranium ore.

3.5 MINE DESCRIPTION

3.5.1 Geology:

General

Geologically, the area falls under Delhi Super Group of rocks of Mid Proterozoic Era of the North Delhi Fold Belt (NDFB). These rocks have undergone three phases of deformation. The F1 and F2 phases produced ductile-brittle deformation, while the third phase was brittle-ductile to brittle in nature. The mineralization of the area is polymetallic (Cu, Mo, Zn, Pb, U) and mainly confined to the N-S to NNE-SSW trending shears/fractures. There is a strong impact of structural features on the radioactive bands of Rohil uranium deposit. The disposition of various radioactive bands due to swerves, kinks and shifts make the correlation ore lenses / marker bands very complex. The quartzite hill, which is the only exposure in Rohil Central block, shows a N10°E – S10°W trend as a result of F2 deformation. The litho-units have shown evidences of ductile-brittle deformation in core samples. Minor displacements of litho-units as well as ore lodes along F3 fold axes are also observed. The branching/coalescing of ore lodes, as observed in plans and transverse sections, is ascribed to the nature of shear fractures. The poly-metallic mineralisation follows the F2 deformation fabric. The westward shift of ore lodes from north to south, pinching and swelling and the minor dextral slips in the lodes are due to NNE-SSW strike of the mineralization and post-mineralisation reactivation of F3 faults. The high variability in the grade and thickness is attributed to the vein-type nature of mineralization.

Status of exploration

Rohil-Ghateshwar area has been divided into various exploration blocks, viz. Rohil Central Block, Rohil North Block (East & West), Rohil South Block, Rohil North Extension Block and Ghateshwar. A total of 374 boreholes (346 completed and 28 abandoned) have been drilled as on 31.10.2015 with a cumulative meterage of 157698.45m.

The exploration area falling between S2 and N14 section lines is designated as Rohil Central Block (Rohil deposit). Further north of N14 section, the area is designated as North Block and further south of S2 section line, the area is designated as South Block.

The Rohil central block with a total of 154 boreholes (136 completed and 18 abandoned) with a cumulative meterage of 74570.30 m confined within an area of 1500m x 250m is by far the most potential zone. The systematic multidisciplinary approach followed by exploratory and evaluation drilling has led to prove sizable deposit of uranium in Rohil Central Block. AMD has carried out exploration so far by AMD in KSB, Rohil and contiguous areas in different phases.

Nature of mineralization and ore body

Uranium mineralisation in Rohil area is confined to shear zones that transect through quartz biotite schist, carbonaceous (graphitic) schist and quartzite which acted as passage for hydrothermal solutions. Uranium mineralisation is associated with various alteration features like chloritisation, albitisation, feldspathisation and silicification along with carbonaceous material. Sulphide mineralisation in the form of Pyrite, Chalcopyrite, Pyrrhotite and Molybdenite is closely associated with uranium mineralisation. The ppm analysis of various litho units has indicated that the metasediments rich in carbonaceous matter contain high intrinsic uranium content (upto36ppm) which during the different phases of deformation and metamorphism got mobilized and concentrated along weaker planes. The igneous activity in the form of acidic (albitite, pegmatite and granitoid) and basic (hornblendites and amphibolite) intrusions also has played an important role in mobilizing the uranium from the metasediments besides contributing some amount of uranium concentrating along suitable structural locales.

3.5.2 <u>Mineral Reserves</u>:

Reserve and ore grade is classified information under Atomic Energy Act 1962.

3.5.3 Mineable reserves

Ref 3.5.2

3.5.4 <u>Mining</u>:

The Rohil deposit shall be mined by underground mechanized method of mining. The proposed capacity for the mine shall be 0.75 MTPA. The proposed method of mining shall be longitudinal sublevel stoping mainly as the deposit is favourable for sublevel method.

Based on the this production capacity and the estimated recoverable reserves of the deposit, the life of the mine for the underground operations have been worked out to be 16 years including initial years of partial production.

Underground mining

There are two modes of entries proposed for the underground mine.

- Vertical shaft
- Decline

Both the entries along with other facilities of the mine have been proposed in western side of the hillock considering the area free from settlements and easy availability of land.

A decline (at 7 degree gradient) and a vertical shaft upto a depth of 1000 m is envisaged to be the most suitable mode of entries into the mine considering orebody configuration. Decline may be developed parallel to the orebody with dimension of

4.5m X 5.5m and a shaft of 6m dia may be sunk with 60 cm RCC/PCC lining upto 1000 metres. The shaft with provisions, men, material and ore hoisting will be equipped with suitable winder(s). The site for the shaft and decline need to be chosen considering the layout of the plant, topography, flood level and possibility of deepening this shaft with additional finds through ongoing exploration of AMD. It is proposed to develop the decline initially which will provide early entry into the mine for level development.

With the available information the strata have been considered to be more or less competent for this study. Considering the deposition and dip of the ore body longitudinal sublevel stoping have been considered as most suitable method of stoping.

For the purpose of underground mine design, the assignment of geo-technical study of the strata has been awarded to IIT Kharagpur. The assignment is still under process of completion. Hence in absence of geotechnical study the mine design parameters are not finalized. Strata have been considered to be more or less competent for this study. Considering the deposition and dip of the ore body longitudinal sublevel stoping have been considered as most suitable method of stoping.

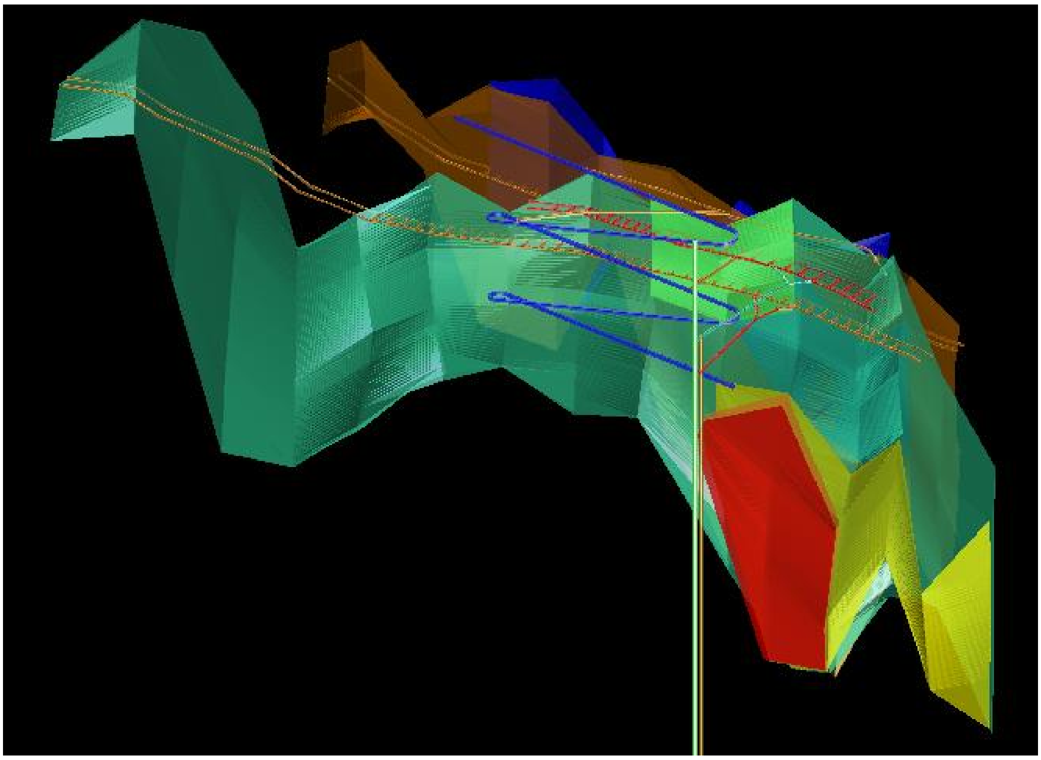
In absence of geotechnical details, the stope design parameters viz. level intervals, sizes of pillars is also tentative. The mine shall be fully mechanized as prominent lodes are favourable for mechanization. Considering the experience from the underground mines nearby, the broad mine design parameter have been proposed in this study. The vertical interval between consecutive underground levels is proposed as 50m with a crown pillar of 10m. As the ore lodes are thin to moderate, sublevel longitudinal stoping may be the suitable method of stoping. As there are 8 number of lodes, at some places some of the lode are very close to each other. In those area stopes can be formed by combining more than one lodes which are adjacent to each other, with some acceptable level of dilution.

Stope productivity:

About 10000 – 25,000 tonnes of ore per month can be extracted per stope. To achieve the productivity of 2500 TPD approximately 4-6 stope should be available for production. Percentage of production to be obtained from Mine development will be about 10% and Production from stopes will be about 90% at different stages of mining.

All the development and stoping operations shall be mechanised. For development jumbo drills/jack hammer and shall be used for drilling of face. LHD & dumper shall be used for loading and transporting of waste rock. For production drilling drifters (57 mm hole dia) and ITH drills (165 mm dia) shall be used and for mucking LHD in combination of LPDT will be deployed.

The percentage of extraction in sublevel method of stoping is generally 75-80%.



3D model showing schematic development of upper levels

List of major equipment for underground mining is given in **Table 2.0**.

Table 2.1: Major Mining Equipment for Underground Mining

Sl.No.	Equipment	Fleet strength
1	Jumbo drill (single Boom)	5
2	Production drill ITH	3
3	Cubex	1
4	jack hammer (Pneumatic)	50
5	Drifter (hydraulic)	5
6	LHD (4.5 CuM)	8
7	LHD (3 CuM)	3
8	LPDT (30 Ton)	8
9	LPDT (20 Ton)	3
10	Rock Breaker (Mobile)	3
11	Low Profile Bolting Machine	4
12	Passenger Carrier	3
13	Scissor Lift	2
14	Explosive Van	2
15	Crane Truck	1
16	Passenger Carrier	3
17	Lube truck	1
18	Mechanic vehicle	1

Table 2.2: List of Auxiliary Equipment

Sl.No.	Equipment	Fleet strength
1.	Fork Lift	1
2.	Tractor with trailor	1
3.	Payloader (2.5 M^3)	2
4.	Front End loader	1
5.	Compressor 2000 CFM	3
6.	Compressor 1000 CFM	3
7.	Main ventilation fan (250 Kw), 156 Cu.M/sec	2
8.	Aux. Fan (90 kW) 7 Cu.M/sec	10
9.	Main UG pumps (300 Kw)	4
10.	Main UG pumps (420 Kw)	4
11.	Pneumatic Face pumps	8
12.	Cap lamp with rack & charger	1000
13.	Exploders with Ohm meters	15
14.	Explosive van	1
15.	Ambulance van	2

Table 2.3: Equipments for Hoisting

Equipment	Type	No.	KW
Winder # 1 (ore Hoisting)	Friction winder	1	1700
Winder # 2 (Men winding)	Friction winder	1	500

3.5.4.1 Underground ventilation

It is proposed that mine will be ventilated through 2 Nos. of main mechanical ventilators (exhaust fans of 250 KW, 156 m3/sec capacity each) installed at two ventilation shafts (3.6m dia) at exhaust ends. It is proposed to allow fresh air to enter through decline and main vertical shaft. The fresh air will reach to farthest part of the active mine workings and pass through active man ways to return through ventilation raises and ultimately through the ventilation shafts. Detailed ventilation network is to be designed after conducting detailed study by reputed institution.

Ventilation at headings: During initial development stage, it is proposed that ventilation of blind heading to be done by boreholes (dia. upto 24") from surface. Method of mining proposed is fully mechanized, and hence it is estimated that at a time 10 faces will be working. Assuming all the headings requiring the forced ventilation a total of 10 auxiliary fans (90 kW each) with suitable ducting will be required.

3.5.4.2 Strata Control

It is recommended that after opening, in-situ geo-mechanical property of the rock mass should be studied by reputed institution like CMRI, NIRM, IIT(ISM), IIT KGP etc., to finalize the pillar size and other support criteria. However for normal supporting of the stope, during stoping operations, rock bolts should be the primary means of support.

3.5.4.3 Mine Drainage:

Three nos. of pumps shall be used to pump out the water inflow of the mine during initial stages of mining operations. The pumped out water will be directed to the Effluent Treatment Plant (ETP) and the water will be recycled for the industrial use.

3.5.5 Mineral Processing:

A process plant based on acid leaching route with a capacity to process 0.75 million TPA of ore per day is planned adjacent to the mine. A general flow sheet of the plant is shown in Fig. 1.

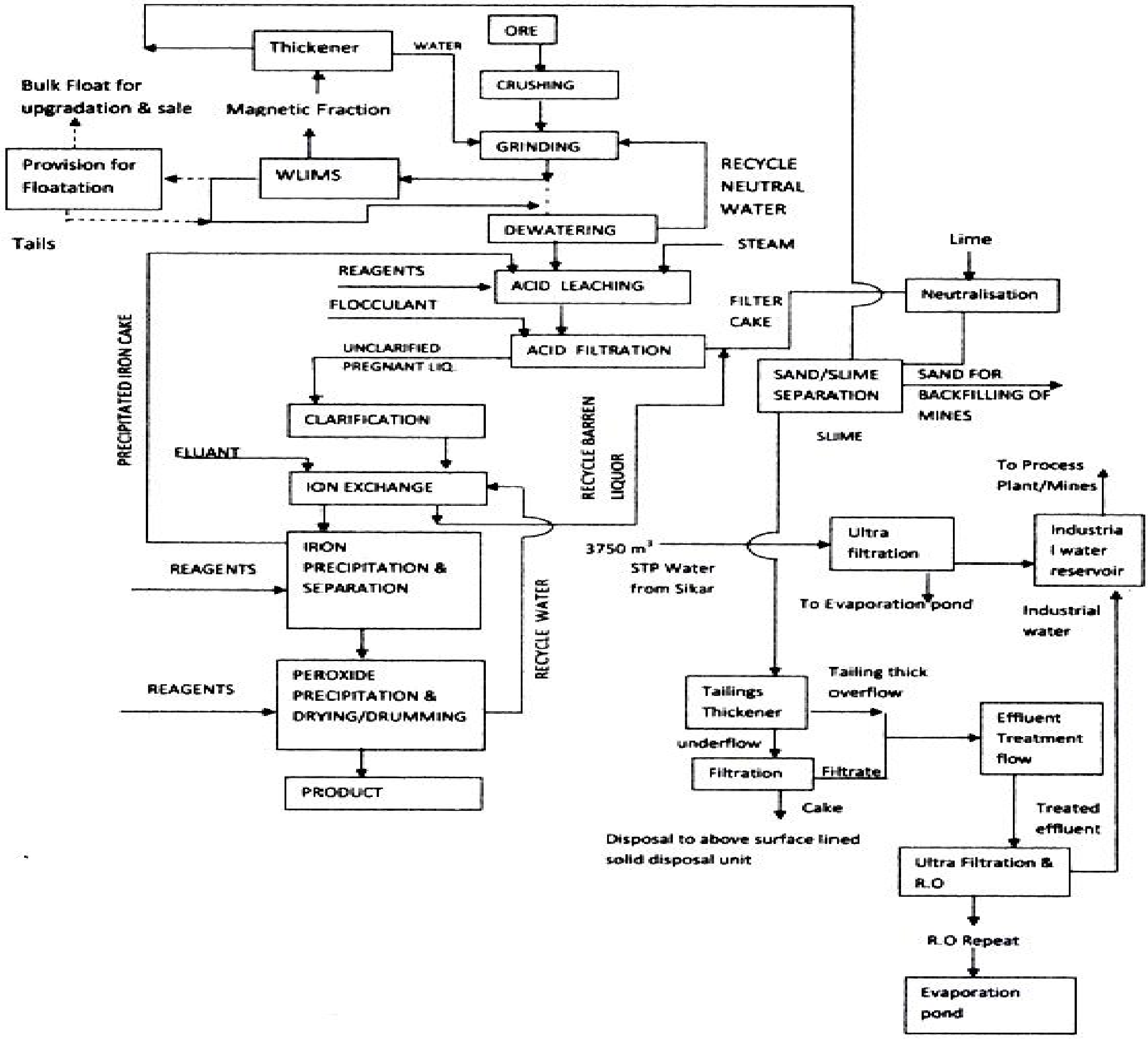


Fig. 1: General flow sheet of the plant

The uranium ore processing plant (eU3O8- 0.05% in feed ore) is a hydro-metallurgical plant following the acid leaching method. The plant will be fed with the primary crushed ore produced from Rohil mines. Primary crushed ore will undergo wet grinding in SAG mill followed by ball mill grinding to produce 65% -75 micron product. Considering the mineralogy which shows substantial presence of pyrohotite mineral containing iron sulphides and CuS, magnetic separation in Wet low intensity magnetic separation (3 kGauss) have been envisaged to recover iron bearing material. The non mag is then subjected to floation to float CuS and MoS to reduce sulphide content in the ore which is needed for effective uranium extraction. The sink of flotation in the form of slurry is thickened and leached in leaching tanks under controlled pH and temperature conditions. The leached liquor is then filtered and undergoes ion-exchange in which uranyl ions get adsorbed in the resin. This is further eluted and treated with hydrogen peroxide and ammonium hydroxide solution to get uranium peroxide (UO4.2H2O) or yellow cake which is thickened, washed, filtered, dried and packed in drums. The final product of UCIL plant is the Yellow-cake (uranium peroxide) which will be sent to Nuclear Fuel Complex, Hyderabad for further processing to nuclear grade fuel.

Considering water scarcity in Rajasthan, Rohil plant shall be unique in design to maximize the re-use of water, high recovery of the product and minimum discharge of effluents.

General

The mined uranium ore having 0.05% eU3O8 shall be processed in the mill to produce yellow cake as per process developed by BARC.

SAG mill+Ball mill combination has been considered to reduce the size of primary crushed to first -1mm in SAG mill and then to 65%, 75 micron in Ball mill. SAG mill is selected considering the hardness of ore (BWI of 21.39). SAG mill and Ball mill combination will eliminate the requirement of secondary & tertiary crushers and Rod Mill. Ball mill product size have been fixed considering optimum leaching.
Further, considering future requirements, space provisions inside the mill for further process optimization and outside the mill for further expansion projects have also been kept.

Process Flow

2500 TPD of mined ore (F80, -500mm) will be fed to grizzly where the oversize will be reduced by rock crushers and undersize and crushed oversize will be fed to jaw crusher (37” X49”) to produce -200 mm. The crushed ore will be brought to the surface where it will be stockpiled. The crushed ore will then be fed to grinding circuits to produce 65%, -75 micron material which is the recommended size for the leaching process. The ground ore will be thickened first to recover water and then it will be fed to the magnetic separation circuit. The recovered mag will be collected and will be pumped to tailing thickener. The non mag will be again thickened and fed to flotation for removing sulphides. CuS & MoS are also recovered in the process. The float ore is then subjected to thickening and neutral filtration in horizontal belt filters.

Acid leaching is carried in a series of eight (6+2) nos. Agitated Tanks in which sulphuric acid & manganese di-oxide are added with injection of steam to make uranium soluble in liquor. BARC has conducted the leaching tests at 40 degree, however, the leaching temperature of 50-55 has been considered as per existing practices of UCIL. 10 hour residence time, 1.5-1.8 pH, 50%solids, 50-55 degree temp) Redox potential of 400-420 has been considered as process parameters. The leached pulp i.e clarified pregnant liquid is then fed to Horizontal Belt Filters to obtain uranium pregnant liquor as filtrate and further clarified in clarifier before feeding to fixed bed ion exchange.

The clarified mother liquor shall be subjected to ION exchange (anion exchange) in three chains each of four columns. The eluate obtained after ion exchange shall be subjected to two stage precipitation & filtration. Barren liquour from Ion exchange will be sent to effluent treatment plant for further treatment for water recovery.

First stage precipitates iron gypsum cake using lime to reduce iron & sulphate to iron gypsum precipitate. The filtered gypsum cake is re-circulated back to leaching tanks for recovery of occulded uranium. Second stage shall precipitates uranlyl sulphate using H2O2+NH4OH.

The precipitated uranly sulphate will be thickened, filtered & spray dried to produce yellow cake having 2%moisture. The thickener over flow will be recylcled back to process. The produced yellow cake will be stored in product store for further onward transportation.

The discharge cake from Horizontal belt filter is mixed up with industrial water and sent to sand/slime separation plant. Sand is taken on surface to use for backfilling of mines and slime is sent to neutralization tank where excess barren liquor is also fed and neutralized by addition of lime. The neutralized slime is then taken to Tailing thickener for taking out excess water and thickened slurry (U/F from thickener) is then pumped to tailing pond.

The magnetic from WLIMS circuit & float from the flotation process shall be sent to another set of hydro-cyclones in the sand / slime separation plant. The sand will be use for back filling and the slime will be sent to tailing pond.

Primary Crushing in underground Jaw Crusher

The mined uranium ore (Run of mines ore of max size 900mm) from mines will be received in 300 tonnes capacity ground hopper and will be fed to jaw crusher for primary crushing to produce -200 mm material. A vibrating grizzly has been considered before jaw crusher to reduce the load on the primary crusher and to minimize the potential for choking due to wet, sticky ore and separate the fines. The primary crushing plant will operate for 300 days per annum in three shifts.

Necessary handling, hoisting & dust extraction facilities have been considered. The major parameters of the primary crushing plant is given below.

Table 3.0: major parameters of the primary crushing plant

Sl. No.	Under Ground Primary Crushing Plants	
1	Annual Feed to jaw crusher	750000
2	Annual Days	300
3	Operating hours per day	18
4	Availability	70
5	Utilization	95
6	Effective operating hours per day	12
7	Rated Capacity, t/hr	208
8	Design Capacity, t/hr	300
9	Indicative CSS, mm	125-150
10	Feed sizing (80% passing), mm.	500
11	Product sizing (80%passing), mm).	200
12	Maximum Lump size mm	900

30000 t Uranium Ore Feed Stockpile & 2500 t SILO

Primary crushed ROM ore will be hoisted at the rate of 250 -300 t/hr to surface to ore hoist hopper in the surface. The hoisted ore will be either stacked in a 30000t open stockpile through a tripper conveyor or it will be directly conveyed to SILO of 2500 t capacity. Material from stockpile will be reclaimed through pay loaders. 30000t stockpile have been considered to provide ore to Mill on continuous & sustained basis.

Grinding Mills

BARC has indicated a bond work index BWI of 21.39 for the Rohil ore which indicates that Rohil Ore is different from Uranium ore of Jharkhand where the BWI is 11-11.5. Considering the BWI of Rohil ore, Semi Autogenous Grinding (SAG) have been considered which is suitable for such type of ore. This eliminates requirement of secondary crushing, tertiary crushing & rod mill
Merits of SAG Mill

- Elimination of crushing plant.
- Lower capital and operating costs.
- Lesser Pollution as it is a wet grinding
- Lesser space requirement for size reduction from -200 mm to -1mm

Single line of SAG Mill of capacity 125 t/hr has been considered to grind -200mm of uranium ore to -1mm which will again fed to 125 t/hr ball mill working in close circuit @ 250% recirculating load to produce 80% -150 micron / 65%, -75micron ground uranium ore to meet the leaching requirements.

The ball mill product will be classified in hydrocyclone to produce product as specified above. Hydrocylone under flow will be recirculated to ball for further grinding whereas hydrcyclone overflow will be sent to thickener for possible water recovery before magnetic circuit.

Design of SAG mill & Ball Mill have been done keeping of view the BWI of 21.39, however test on SAG mill and ball mill will be undertaken during execution / engineering of the plant to firmly establish process parameters.

Table 4.0: major parameters of the design of SAG mill & Ball Mill

Sl No	GRINDING MILL (SAG & BALL)	Description
1	Annual Feed	750000
a	Annual Days	300
b	Effective operating hours per day	20
7	Rated Capacity for SAG & BALL MILl, t/hr	125
8	Design Factor, %	10-20
9	BWI, kWH / t	21.39
10	Feed size (80% passing to SAG Mill), mm.	-200
11	Product size (80%passing SAG Mill), mm).	1
12	Feed size (80% passing to Ball Mill), mm.	-1mm
13	Product size (80%passing Ball Mill), micron).	150
14	Re-circulating load, %	250

Neutral Thickener & Magnetic Separation

Ball mill product is obtained at 20% solids which will be thickened in neutral thickener 1 to remove water. Recovered water will be recycled and the thickener under flow will be pumped to magnetic separation circuit which is included in the circuit to remove high quantity of iron sulphides present in the ore and considering ferro magnetic nature of the Rohil uranium ore. BARC has conducted magnetic separation tests at 4 kGauss and 3 kGauss and have finally recommended 3 kGauss. Wet low intensity magnetic separation (WLIMS) have been considered to separate mag and non mag from the Rohil ore. The mag ore will be sent to tailing thickener whereas non mag will be sent to neutral thickener for water recovery. Neutral thickener 2 has been kept in the circuit considering possibility of lower % solids in WLIMS during operations. It may be note here that existing UCIL plants do not have WLIMS facilities.

Flotation (in 2nd Phase)

Considering the substantial presence of sulphides in the ore, BARC has incorporated flotation in the circuits. The feed uranium ore contains 0.14% cu and 0.024% Mo. The flotation will float CuS (Cu-1.13%) & MoS (Mo-0.213%) which are predominant in the sulphides. Floatation has been recommended on the non mag of the WLIMS.

BARC has conducted flotation on rougher stage only showing an enrichment ration of 8-9 for CuS & MoS which is expected to reach to 30 after cleaning stage and the same will be confirmed by BARC in the next level of test works. It may be noted that even after cleaning the obtained products are not of marketeable grade and further leaching will be required to upgrade it to 25 % Cu which has a market. Accordingly space provisions has been kept for addition of leaching circuits for Cu & Mo recovery also in the Uranium leaching bay. Flotation of 110 t/hr (approximate) have been considered using sodium silicate as dispersant, sodium isopropyl Xanthate (SIPX) as collector and Amyl alcohol as frother @ 30-35 % solids. Non mag of WLIMS after thickening in neutral thickener will be pumped to flotation conditioning tanks where it will be conditioned for around 5 minutes and then reagents will be added and it will be fed to flotation cells.

Four banks each with three-four cells of 10m3 have been planned for rougher circuit. Similar cleaner circuits have been considered however cleaner circuits will be firmed up after further detail test works. However, it may be noted that no additional cost benefits have been considered on account of recovery from Cus & MoS.

Neutral & Acid Filtration

Two working horizontal belt filter and two standby horizontal belt filters have been considered for both neutral and acid filtration. Sink of flotation will be pumped to neutral filtration unit to recover water and recirculate back it to circulation tank. The filtered cake will be pumped to leaching tanks for leaching. The leached slurry will be filtered in horizontal belt filter to separate pregnant liquor.

The horizontal belt filtration section will operate 300 days per annum. The section will be designed to separate the solid and liquid phases for further uranium extraction process of mother liquor obtained after filtration. The design of the section is based upon the following major process parameters.

Leaching

Leaching section has been considered for approximately 101 t/hr to be leached in six number of tanks. Neutral filter cake will be repulped with secondary filtrate to control density of around 50% solids by weight will be fed to six operating leach tanks in series each with a working volume of 260 m^3 providing a nominal total residence time of 10-12 hrs. Flow through the leach tanks will be continuous. Two standby tanks will be provided to maintain residence time during maintenance of other units. All leach tanks will be made of mild steel lined with natural rubber.

Sulphuric acid only will be added to the first leach tank dissolve iron and liberate reducing gases prior to pyrolusite addition. Sulphuric acid will be pumped from the storage tanks to a day tank within the leaching area. pH monitors will be considered to monitor the pH. Pyrolusite slurry will be pumped from the pyrolusite preparation plant to a day tank within the leach area.

The temperature of the leach slurry will be maintained at 50-55°C by live steam injection. Leached pulp will gravitate to two nos. each of 120 m^3 mechanically agitated surge leach pit tanks which will be provided with a discharge pump with a common standby.

Clarification

In order to maximize the efficiency of Ion Exchange, a high clarity of feed solution is needed. Precoating arrangement shall be done and all arrangement for handling precoat material, slurrification and feeding to precoat filter shall be provided. Clarified pregnant liquor will be stored in clarified pregnant liquor tanks prior to feeding to Ion Exchange operation. Around 100m^3/hr of filtrate will be subject to clarification.

Ion Exchange

Clarified pregnant liquor at 1.5 pH shall be processed in fixed bed Ion Exchange system for concentration of Uranium on a similar way being practiced at Jaduguda. Absorbed Uranium will be eluated by 15% sulphuric acid solution.

In line with Jaduguda plant, three (3) chains of Ion Exchange circuits each having four (4) no. Fixed bed columns have been considered for this project. Out of four (4) columns, 2 columns in series undergo ADSORPTION with one (1) column in ELUTION. The fourth column remains standby after regeneration.

In Jaduguda plant, each Ion Exchange column contains about 7.1 cubic metre of strong base anion resin. If the similar philosophy and vessel sizes are considered for 2500 TPD ore processing capacity with resin as indicated by BARC, 5 chains of 4 column combination like Jaduguda would be adequate. For 3 chains, 4-column combination, resin quantity in each vessel shall be to (about 9-9.5 m3/vessel) with subsequent increase in vessel sizes. For better plant operation, cost and space optimization, 3-chains of 4 columns Ion Exchange system have been considered. The resulting barren is pumped for effluent treatment plant / replulper tank in acid filtration unit.

Eluate will be collected in a storage eluate tanks for subsequent processing in the precipitation circuits. Exhausted resin in column will be periodically regenerated with caustic soda solution for removal of ions, which may build up during normal operation.

Iron Gypsum Cake precipitation

Iron precipitation section where principally precipitation of ferric iron and sulphate as ferric hydroxide and gypsum by controlled raising of pH of the eluate in three mechanically agitated tanks in series, thickening of precipitate in a 12 m diameter thickener and filtration with washing of thickened precipitate in two stage rotary vacuum drum filters, each 5 m2 in series will be done.

Eluate (25.82 m^3) will be pumped to the first of the three precipitation tanks. Lime slurry will be added to the precipitation tanks to raise the pH to approximately 3.5. The three precipitation tanks will provide a total of 4 hours residence (as indicated by BARC) time at maximum eluate flow rate.

The overflow from the third precipitation tank will gravitate to the iron precipitate thickener. The thickener overflow will be collected in pure eluate surge tank for further processing in the subsequent precipitation circuit. For UO4 precipitation, filtrate from iron thickener overflow shall be passed through a precoat-filter.

Iron precipitate from the thickener underflow at approximately 30% solids by weight will be pumped to the two drum filters in series for recovery of liquor. Filtrate from the filter will be returned to the thickener, and the cake will be repulped and pumped to the second filter. Filtrate from the second filter will provide repulping and wash liquor for the first stage. The cake from the second stage will be repulped and pumped to the leach circuit for recovery of occluded and co-precipitated uranium. Final stage repulping and wash liquor will be provided from the MDU / UO4 thickener overflow after proper pH adjustment. The iron precipitation circuit has been designed for a throughput flow rate of 30 m^3/hr.

UO_4 Precipitation

The dissolved uranium values in the IGC filtrate was precipitated as uranium peroxide.

Precipitation experiments were carried out by careful addition of hydrogen peroxide to the IGC filtrate. The release of H+ ions during the addition of hydrogen peroxide shift the pH torelatively higher acidity as given in following chemical reaction.

$UO_2SO_4 + H_2O_2 + 2H_2O \rightarrow UO_42H_2O$ insoluble $+ H_2SO_4$

The rise in acidity was controlled by constant addition of ammonium hydroxide such that the equilibrium pH persists at 3 – 3.5.

The reaction was carried out with constant mild stirring under ambient conditions in three number of precipitation tanks. After the completion of addition of hydrogen peroxide the slurry was kept under agitation for 4 hours followed by filtration.
The system will consist of three mechanically agitated precipitation tanks in series providing approximately 4 hours residence time, a thickener to thicken corresponding precipitate and filter feed service tanks.
Design, operation and control and inbuilt flexibility will be similar to Iron precipitation circuit. Thickener overflow will be recycled to IX circuit.The consumption of 30% pure (Wt/Vol) H_2O_2 and NH_4OH (12.5% Wt/Vol.) shall be 0.524 and 0.74 kg for every kilogram of U3O8.

Product Filtration & Drying

Product filtraion will comprise a small horizontal vacuum belt filter, electrically heated Spray Dryer along with product packing system. Thickened UO4 slurry will be pumped to the belt filter. The filtrate will be recycled to UO4 thickener and the cake at approximately 50% moisture by weight will be repulped at 30-35% slurry and pumped to spray dryer by high pressure pumps. The preformed UO4 will be dried to about 2% moisture by weight in the electrically heated spray drier.

Dried product from spray drier shall be pneumatically lifted and extracted by cyclone and bag filter system. Clear air after passing through bag filter & HEPA filter will be exhausted. The drier and packing area will be enclosed in an enclosure to provide a secondary protection against radioactive dusts. UO4 will be stored in a small local store prior to shipment to the main product store.

This filtration and drying section will normally operate for two shifts per day and the operation will be remote automatic except drums loading onto and unloading from the roller conveyor.

Tails Thickener for WLIMS Mag and Flotation float

A tails thickener for WLIMS mag and flotation float have been envisaged to recover water. Thickener u/f will be pumped to sand slime separation plant whereas thickener o/f will be pumped to circulation water tank.

Tailing neutralization

The leached pulp filter cake will be repulped neutralized barren before sand slime separation operation. The overflow from the hydrocyclone of sand slime separation unit will be pumped to four agitated neutralization tanks, identical to the leach tanks, in series providing a residence time of approximately 5 hours. Normally three tanks will be in operation and one tank will be always in standby mode for maintenance. From the day tank the slurry will be pumped to a ring main around the neutralization tanks recirculating a part back to the day tank to avoid choking in the pipe line. Neutralized pulp will overflow from the last neutralization tank into a pump box from which it will be pumped to the sand slime separation plant.

Sand Slime Separation plant

The slurry will be pumped to set of hydro cyclones. The coarse underflow, which will be used for sand filling in the underground and will be collected in underflow chute and diverted by gravity from an adequate height to a self-draining conical sand pad.

The drained water will be collected in a sump and pumped back to the tailing thickener. The cyclones overflow will gravitate to tailing thickener 2. The underflow from the tailing thickener will be extracted by one of the two variable speed pumps and delivered to tailing pumps sumps for pumping to tailing pond while the recovered water will be recycled back for leached pulp filter residue repulping. Provisions will be made for bypassing sand slime separation plant during non-requirement of its operation to deliver the neutralized slurry either to tailing thickener or directly to the sump of tailing disposal pumps depending on the slurry consistency.

Effluent Treatment Plant

During the processing of uranium ore, some radio-nuclides are generated and remain in the tailings. It is also not possible to recover entire uranium from the ore. Therefore an Effluent treatment plant has been envisaged to ensure the effluent discharged are environment friendly.

Effluents will be treated for manganese and radium removal. Lime treatment for manganese removal and BaCl2 treatment followed by clarification and filtration process for radium removal will be followed.

The effluent will be pumped to three (indicative) mechanically agitated radium precipitation tanks each of 100m3 capacity to which a 2% barium chloride solution will be added at a rate of approximately 25 mg/1 to fix radium as the insoluble radium, barium sulphate co-precipitate.

Lime dosing may be done in radium barium sulphate precipitation tank, deferring installation of separate lime treatment tanks. The discharge from the radium removal tanks will flow to a flash flocculator and two flocculation tanks in series The flocculation tanks will discharge to an 8m-diameter of 'high rate' type clariflocculator. Radium, barium sulphate co precipitate will be removed from the underflow at a pulp density of approximately 5% solids and pumped to the tailings dam for disposal. A partial thickener underflow 'recycle will be used to maintain an aged flocculant bed in the thickener. Flexibility of recycling the sludge to flocculation tanks will also be provided. Thickener overflow may contain extremely fine co precipitate particles and will be pumped to an 8 m2 mixed bed (sand/anthracite) pressure filter for final clarification prior to discharge to the monitoring ponds.

Treated effluent will be recycled to make up the reagents used in the radium removal plant along with treated mine water for recycling in the plant. Effluent in the monitoring pond will be regularly sampled and assayed, and if necessary, may then be recycled to the radium removal plant for re-treatment, otherwise shall be allowed to mix with the rain water reservoir for further dilution and discharge during monsoon.

Reagent preparation Tank

(a) Sulphuric Acid Storage
It is proposed that 98% sulphuric acid will be stored in tanks.

(b) Pyrolusite
It is understood that pyrolusite ore, containing approximately 55% MnO2, will be delivered by lorry, and that all ore will be normally minus 2 inches in size, occasionally marginally higher.

Crushed pyrolusite will be withdrawn from the mill feed bin by a vibrating feeder onto the ball mill feed conveyor at a rate of 3.5 t/h. The 1.8 m. diameter by 3.6 m. pyrolusite ball mill will be in closed circuit with a 200-250 mm. Hydrocyclone classifier. Cyclone overflow will proceed to a thickener. Thickener overflow, augmented by make up water, will be recycled to the pyrolusite mill circuit for dilution, whilst the underflow at between 40% and 50% solids will be pumped to the 80 m^3 mechanically agitated pyrolusite slurry storage tank within the leach circuit area.

(c) Flotation reagents (for 2nd phase)
Flotation reagents meeting flotation requirements will be delivered by lorry and will be stores in flotation reagent area in the flotation building.

(d) Filter Floculants
Filter flocculant will be made up manually in one (1) 5m3 tanks. The 0.5% strong polyelectrolyte solutions made in above tanks will be further diluted and stored in two (2) nos. of 20 m3 tank. Each tank will provide in excess of one shift flocculant requirement. One tank will be in use whilst the second is being made up.

(e) Ion Exchange Acid Storage
98% sulphuric acid storage tank will be provided within the Ion Exchange section for eluant make up. Acid will be pumped from the main storage tanks to the ION Exchange acid storage tank under close supervision when required.

(f) IGC & UO4 Precipitation
It is assumed that reagents will be received in bags or drums, and that reagent preparation will be manual.

High grade lime slurry will be made and stored in two nos. of mechanically agitated tanks of 25 m^3 capacity. Lime slurry will be circulated round a ring main by a 10 m^3/h pump. For UO4 precipitation, H_2O_2 will be stored in 50m3 capacity storage tank and ammonia as ammonical liquor would be available in another 15 m^3 capacity storage tank.

(g) <u>Neutralisation circuit Lime</u>

-50mm Limestone (55% CaO) or burnt lime will be delivered into a 30 tonne receiving hopper and fed by a vibrating feeder to a jaw crusher. Minus 3/8" crusher product will be conveyed to a 100 tonne storage bin from which it will be fed to two (2) nos. of lime slaker 2134mm dia x 13750 mm long in closed circuit with a 1829 mm dia x 6090 mm long rake classifier. Classifier underflow will be recycled to the mill whilst overflow at 10% solids will be pumped to a 200 m3 capacity agitated stock tank.

Lime slurry will be transferred to a 200 m^3 capacity agitated circulating tank in neutralizing area where it will be diluted as required before being pumped to neutralization. Excess lime slurry will return to the circulation tank.
Lime will be stored in lime storage hall of about 800 ton storage capacity.

$Bacl_2$ make up: Barium chloride solution (2%) will be made up manually in two tank of 5 m^3 capacity each.

Pre-coat: Facility shall be provided for pre-coat material storage, handling, slurryfication and distribution to pre-coat filters.

3.5.6 <u>Mineral Transport</u>

ROM ore from the mine will be transported by covered conveyors to the ore processing plant. Uranium concentrate (SDU) will be dispatched to Nuclear Fuel Complex, Hyderabad by specially designed road trucks.

3.5.7 <u>Life of the Project</u>

Considering the applicability of sub level method of stoping, the mine is expected to produce 2500 tonnes of ore per day with average grade of ore of 0.045% eU3O8. Considering the capacity of 2500 TPD ore extraction, the life of the mine for the underground operations have been worked out to be 16 years including initial years of partial production. However, assuming ore findings in the region with on-going exploration activities, life of the operations may be considered as more than 25 years.

3.5.8 <u>Raw Materials</u>

The mine shall consume 225 t/yr of explosives. Explosives will be kept in the existing magazine of 20 t capacity. The mine shall consume 525 KL/yr of diesel and 63 KL/yr of Hydraulic oil & Lubricants.

The raw material requirements for the ore processing plant is given below in **Table 5.0**:

Table 5.0: Major Chemicals & Reagents Consumptions

Flotation (in 2nd phase)

- Na_2CO_3, Kg/t : 0.5
- SIPX, Kg/t : 1.0

Leaching

- H_2SO_4, Kg/t of leached ore : 65
- MnO_2, Kg/t : 3.5

Ion Exchange

- H_2SO_4, Kg/t of annual feed : 31.32
- NaOH, g/t of annual feed : 50

UO4 Precipitation

- H_2O_2, Kg/t of annual feed : 0.202
- NH_4OH, Kg/t of annual feed : 0.287

Lime

- IGC, Kg/t of annual feed : 10.3
- Neutralisation, g/t of annual feed : 20

3.5.9 Resource Optimization / Recycling and Resource

The process of the ore processing plant has been designed so that residual caustic soda and sodium carbonate after recovery of sodium sulphate are recycled back to the process.

3.6 SITE SERVICES

3.6.1 Water Requirement:

The total peak daily requirement of water for mines and mill would be 4000m^3.The processing water for the ore processing plant and mining area shall be met from the STP water from Sikar town. For the potable and other purpose the estimated requirement is 100 m^3 which shall be made available from Khandela.

3.6.2 Power Requirement

The estimated power requirement of the proposed 0.75 million TPA mines and processing plant would be 20 MVA, out of which 2.80 MVA is for mining facilities and 17.20 MVA for main plant and township. The power supply shall be made available from the 132 kV grid sub-station from Khandela more GSS which is located about 4.0 kms on eastern side of the proposed plant. The Khandela substation shall be augmented from Ranoli sub-station.

3.6.3 Amenities

Rest shelters with drinking water facilities, toilets, bathing and washing facilities and canteen will be constructed as per the requirement. First Aid Centre with an ambulance always facility will also be made available. Other amenities and infrastructure, such as township, hospital, stores, workshop, community centre, schools etc. will be constructed.

Modern township for 2500 dwelling units in 300 ha with all related facilities, like roads, electrical power supply, water, etc has been considered.

3.7 WASTES

About 300000 m^3 of waste rock will be generated during initial mine development which will be brought to surface for external dumping.

The ore processing plant will be generating the following wastes:

Tailings	: 750000 t/yr
• Calcium Sulphate	: 375000- 525000t/yr
• Tailings for backfilling	: 525000 -375000 t/yr
ETP Sludge	: 500 t/y r.
Filter-media	: 500 t/yr.

About 750000 tonnes /year of tailings will be generated from the process plant of which about 30% will be used for stowing initially which will increase upto 50% afterwards. Balance 50% will be dumped in the tailings pond. The waste filter media generated from the ore processing plant and waste water treatment plant sludge will be contained in tailings pond. It is estimated that tailing pond would have an area upto 600 ha which would be sufficient for storing tailings. The height of the tailing pond shall be 10 m with free board of 2m. The dam shall be lined with suitable liners to ensure zero discharge into the ground water. Water shall be needed to be pumped back to processing plant initially by float pumps. Near the disposal pond piping will have the flexibility of realignment. Solid tailing will be retained in the tailings pond whilst effluent will be decanted to decant water pond. The decant water will be pumped back to the plant for treatment and recycling.

The solid tailings which emanates out by processing of uranium ores should be disposed-off properly and for this suitable site based on the following parameters should be opted.

- Availability of sufficient land to store the tailings that would be generated during the entire life of the deposit
- Presence of natural barrier surrounding the area to hold the tailings.
- Proximity to the processing plant
- Away from habitation.
- Catchment area.
- Away from the major water body.

3.8 ENVIROMENTAL PROTECTION AND CARE

Principal environmental concerns in a uranium ore mining and processing industry originate from radioactive sources such as uranium & its daughter nuclei present in the ore. Solid, liquid and gaseous effluents are generated in various processing and non-processing areas, which are required to be contained in an environmentally acceptable manner. Therefore, keeping in view the requirements of environmental protection pollution control measures have been adopted in the design of proposed 0.75 million TPA Uranium Ore Processing Complex.

While designing the plant, full care should be taken to save the surrounding environment based on the existing technology. These include:

- Disposal of solid waste (disposal of tailings).
- Zero water discharge (effluent treatment plant).
- Radiation protection for individuals by Health Physics Unit.

Effluent treatment Plant (ETP)

The effluent from the plant shall be treated in Effluent Treatment Plant where fixation of radium from the effluent by barium chloride and lime in radium removal unit has been envisaged. It has been observed that lime treatment with sufficient residence time achieves appreciable precipitation of dissolved radium. Treated effluent will be further filtered in sand filter before it is being recycled to the process plant for reuse. Normally entire amount of treated effluent will be recycled back in the system / process plant.

Radiation Protection for Individuals by Health Physics Unit

The proposed 0.75 million TPA uranium mines processing Plant will process the uranium ore according to the stipulations of various National and International standards. Keeping in view the effects of radioactivity, efficient and stringent monitoring of the doses is to be done. In order to achieve this objective, a full-fledged health physics unit will be established with fully equipped laboratory to monitor the radiation exposure of the workers and the general public living in the vicinity. Besides, it will undertake the industrial hygiene monitoring of mining and milling workers.

4.0 SITE ANALYSIS

4.1 CONNECTIVITY

The lease area can be approached by national highway NH11 from Jaipur to Palsana (85 km), state highway from Palsana to Khandela (20 km) and further about 4 km metalled road from Khandela to Rohil.

The nearest railway station is Palsana which is about 15 km from project area.

4.2 LAND FORM, LAND USE, OWNERSHIP

The project area mostly comprises of aagricultural and barren Land. AMD has already acquired 23.57 Ha of Govt. land. Total land requirement for the project area is 1300 ha.

4.3 TOPOGRAPHY

Sikar district roughly forms a crescent shape and is bounded by latitude 27°07'00"N and 28°12'00"N and longitudes 74° 41'00"E and 76°05'00"E. It covers an area of 7742 sq km. Sikar district comprises three distinct geomorphological units, (i) hilly area (Aravalli range) in the east (ii) undulating area with hillocks in the centre and (iii) western desertic plain. The altitude of the highest peak (Raghunathgarh) is about 1052m. Few other known peaks of the area are Harsh, Deogarh and Shyamgarh. The plain area lies generally at altitude between 350 and 530m.

The study area has a combination of hills and plain areas. Since the region is semi-arid, perennial streams are virtually non-existent, the pattern of drainage is dendritic with numerous drainage channels. Because of low rainfall, there are no perennial streams / rivers in the study area and all drainage channels in the study area are seasonal. However the major rivers flowing in Sikar district are Mendha, Kantli, Dohan, Krishnawati and Sabi. Kantli river originates near Khandela and flows in north-eastern direction. Mendha river originates about 30km south south-east of Khandela and flows south-westerly direction and merges into Sambhar.

4.4 INFRASTRUCTURE

Mine office, time office, rest rooms, Area for Field maintenance facilities, Sub-station building, and Switch gear rooms, Vehicle maintenance facilities, Canteen and rest shelter, Site office, DG room, laboratory, environmental lab and WTP has been envisaged for the project. Other amenities and infrastructure, such as township, hospital, stores, workshop, community centre, schools etc. are also being proposed to be constructed.

4.5 SOIL CLASSIFICATION

The soil type available in the Rohil area is loam pebbly & stony.

4.6 CLIMATE

The mine lease area lies in tropical region where climate is characterised by very hot summers and cool winters. Summer is typically from March to June when average daily temperature ranges from a maximum of ~41°C to a minimum of 15.4°C. Winter is from November to February when average daily temperature ranges from a maximum of ~27°C to a minimum of 7.4°C. The average annual rainfall as recorded at IMD observatory at Sikar is 463 mm. The Southwest monsoon lasts from mid-June to mid-September and the area gets more than 80% of the annual rainfall during this period. July, August and September are the three wettest months (in that order).

4.7 SOCIAL INFRASTRUCTURE AVAILABLE

The nearest town, Khandela, has all necessary social infrastructure. In addition, UCIL is also building its own township which will have necessary facilities for its employees.

5.0 <u>PLANNING BRIEF</u>:

5.1 PLANNING CONCEPT:

The proposed project envisages opening an underground uranium mine along with ore processing plant having rated capacity of 0.75million TPA.

5.2 LAND USE PLANNING:

When the reserves are exhausted, the mine will be shut down as per the Approved Mine Closure Plan. Some of the infrastructure will be dismantled. Others will be handed over to the State Government or the local village panchayats. The waste dumps will be stabilized and biological reclaimed.

5.3 ASSESSMENT OF INFRASTRUCTURE DEMAND

UCIL shall construct centralized workshop, stores, explosive magazine and other requisite infrastructures etc. to cater the needs of Rohil project.

Rohil project will employ 2500 persons, many of whom, especially most of the unskilled and semiskilled workers, will be local villagers. The rest comprising of the officers, supervisors, some of the office staff, skilled and semiskilled workers may come from outside. These people will be provided accommodation in the project township, which will have all amenities. Township shall be constructed in 300 ha.

5.4 AMENITIES / FACILITIES

All the amenities viz. office, workshop, rest shelter, first aid room, rain water harvesting etc. will be developed within the ML area.

6.0 PROPOSED INFRASTRUCTURE:

The project sites are connected by road network. The area is self sufficient to cater the needs of the expanded project, hence, no additional infrastructure is proposed.

Green Belt & Plantations: Green belt and plantation developed in and around the project area will increase vegetation cover. Before the lease is abandoned, plantations will be created over available areas.

CSR Activities:

UCIL is already doing extensive Corporate Social Responsibility activities under other projects. Similar activities shall be carried out under the this project also.

Activities already taken up are as follows:

- Construction, operation and maintenance of RO (Water purifier plants)
- Holding of medical camps, supply of medicines to villagers.
- Computer training and distribution of books and Journals
- Scholarship for pursuing higher study
- Distribution of school bags among primary students of Govt. schools in nearby villages.
- Installation & maintenance of solar powered streetlights.

7.0 REHABILITATION & RESETTLEMENT (R&R) PLAN

Rehabilitation and Resettlement of Project Affected Persons (PAPs) is part of project implementation and is proposed to be done as per the provisions of LARR 2013. Although R&R scheme is to be formulated by district authority and accordingly compensation is to be paid to Project Affected Families (PAFs).

8.0 PROJECT SCHEDULE & COST ESTIMATE

8.1 Likely Date of Start of Construction and likely date of completion:

The project have been planned to be completed by 48 month from "Zero date", the zero date of which would start once all the statutory clearances are obtained such as:

1. AERB clearance
2. MoEF&CC clearance
3. Consent to establish and operate

4. DAE license

It will be imperative to complete many other activities prior to “zero-date” of the project. These include:

- Actions for enabling works like construction of water line, power line, etc.
- Advance action to be taken to ensure availability of construction material and construction manpower.
- Financial tie-ups, if any

It has been envisaged that Rohil underground mine of UCIL attain its rated capacity of 0.75 million TPA from 6th year of the zero date. However it is subject to receipt of all statutory clearances required for the expansion.

It has been assumed that “Zero-date” i.e. start of the expansion project, will commence after completion of preliminary works like acquisition of Land, grant of mining lease, approval of EIA/EMP and other statutory clearances. Immediately after the clearance of EIA / EMP report by the MOEFCC, mobilization and placement of orders for civil works, structural works and procurement activities for infrastructure facilities will be started so that the above facilities shall be completed well before the start of the mine development works.

8.2 Estimated Project Cost Along and Economic Viability of the Project

The total cost of the project has been worked out to be 3000 crores.

9.0 ANALYSIS OF PROPOSAL (FINAL RECOMMENDATION)

The project will have the following benefits:

- Increase the supply of uranium ore for India’s domestic power generation.
- In addition it will add to revenue generation of the District / State.
- A better alternative for reducing coal dependency.
- It works to reduce paralyzing power shortages hindering growth, foreign investment and productivity.
- The mine will generate additional employment, both direct and indirect which will lead to economic growth of the industrial sector as well as country.
- UCIL shall provide, school buildings, bus shelters, medical facilities and other amenities to local villages under the company’s community development programme.

Considering the above points expansion of the Tummalapalle project has become necessary and important.