

KHEWRA SALT MINES PROJECT

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SEMESTER: FALL 2019, MSPM-III

PROGRAM: MS (PROJECT MANAGEMENT)



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SUBMISSION DATE:

JAN 21, 2020

PREFACE

One of the requirements of MSPM degree program in Bahria University was to learn and practice different Project Management tools and techniques. So to demonstrate what we have learned, we are presenting a comprehensive report of a project we have prepared in Primavera P6, a Project Management Tool.

Our project is to study the Khewra Salt Mines and summarize a report on investigating, mining, operating, marketing and handing over using Primavera P6. This project is comprised of around 56 activities scheduled to one year in completion.

In this report various reports are generated during this project. The report are graphically displayed with the help of Primavera P6.

ACKNOWLEDGEMENT

All praises to Allah Almighty, who bestowed us lots of blessings and beautiful life in this wonderful, amazing and immense universe. Learning is something which our prophet Muhammad (PBUH) induced us to seek more and more knowledge irrespective of the distance and age.

We would like to express our special thanks of gratitude to our teacher Shehzad Ahmed, who enabled us to learn modern project management tools and techniques and apply in practical environment. Primavera proved to be very powerful tool instructed by Sir Shehzad Ahmed and Khewra Mines Project is a complete package where we tried to get maximum utilization through this software.

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CHAPTER # 1

History of Khewra Salt Mines:

In 326 BC, the Greek King Alexander was passing through Jhelum and mianwali during his campaign in India. He ordered his army to stop and take rest in the region currently identified as Khewra, The horse of the Alexander's army started licking the rocks on the earth. Realizing this that almost every horse were doing so, a soldier from his army himself tested the rocks and realized that the taste of the rocks were very salty. Due to this the salt in khewra had been discovered.

Now, about 2330 years after, the salt reserves in the khewra salt mine are the 2nd biggest salt mine in the earth— after the Sifto salt mines in Ontario Canada.

Geologist consider that the rock salt in Khewra is from the Precambrian age i.e. about 600 million years ancient. These mines have an expected 220 million tons of salt. During the Mughal time the salt was exported in different marketplaces, after extraction salt was traded to Central Asia.

On the end of the Mughal Kingdom, the mine was captured by Sikhs. In 1872, British captured the Sikhs' territory and also take over the salt mine, the British developed the mine further.

They determined the mining is ineffective, with rough and tight tunnels and entrances through which the movement of the workers are not easy and unsafe.

The source of water within the mine was not properly designed, and there was no garage facility for the mined salt. The street to the mine was over rough, stony ground.

To address these issues the government street constructed warehouses, supplied a water source, upgraded the entrances and tunnels, and delivered an enhanced method for diggings of salt.

Brief History of Khewra Salt Mines:

326BC	Exposed by the Licking of outcrop salt by the horses of Alexander who fight against Raja Porus
1500AD	ASP khan regional organizer of the khewra reported to the king Akbar about the existence of salt deposit in khewra. Mining initiated
1809	Sikhs occupied the salt mines after Mughals.
1849	British occupied the salt mines.
1853	Drinkable clean water was detected and pass on to khewra in a wooden channel.
1856	Broad Street was constructed joining khewra and P.D khan
1872	Dr. Warth First chief Mining Engineer inspected complete salt mine and started the scientific mining method. He constructed leading passageway at earth level.
1886-87	Railway Link named as Victoria Bridge was built above the river Jhelum
1889-90	The salt Extraction crossed 50.00 Metric Tons
1902	Hospital founded to deliver medical services to the mineworkers and Families of salt mines
1914	The salt extraction was nearly 80,000 Metric Tons.
1918	Dual stream engine trains are operated in the mines to transport rock salt.
1924-25	Energy house with dual diesel Electric Generating sets, 500 horse power were installed.
1932	Cable cutter machines were introduced.
1933	Mechanical loading plant was installed
1974	PMDC take over the Mines

1998	Drilling tub method changed to tractor trolley method
2002	Khewra salt Mines Tourist resort created.
2003	Opening of khewra Tourist Resort.
2005	Khewra Asthma Clinic was created.
2007	Asthma Clinic working started.
2010	Recreation of Khewra Tourist Resort.

Main Features of Khewra Salt Mines:

Site Location	160 kilometers south of Islamabad
Rented field	3,398.53 acres of land
Geographical region	Pre-Cambrian
Cleanness of salt	Ordinary 98%
Colors of salt	White, pink and Red
Extracting technique	Room and pillar
Over-all Reserves	Above 1 Billion
Productivity	382,155 tons(2018-19)
Trades	395,837 tons(2018-19)

Salt appear in the shape of unsymmetrical tomb like construction. There are seven heavy salt layers with collective width of around 150 meters.

Covering a place of 110 square kilometer, 228 meters deep (with 11 isolated levels), the huge salt mine has above 40 kilometers of channels going about 730 meters, or approximately half a mile within the mountain under which the layers of salt are located.

To prevent the large place from falling down completely, just fifty percentage of the salt located is extracted the remaining salt act as pillar and provide support to the remaining salt.

As the khewra salt mine is the second largest mine in the world a large number of employees are required to extract the salt.

According to the data, the Pink rock salt mined from Khewra salt mine has 98 percent halite and is supposed to be as ancient as pre-Cambrian periods.

The salt reserve has around 82 million metric tons of Himalayan rock salt from that almost 0.35 million tons is mined every year.

The salt mine production was registered in 2003 to be 385,000 tons of salt each year, this quantity is nearly half of the Pakistan total production of rock salt.

At that speed of production the tunnel would be likely to last for extra 350 years. The everyday production of salt is 1200-1500 metric ton in khewra salt mine.

Extraction of salt is performed by using the room and pillars technique, mining simply the half of the salt and leaving the other half to provide support to the tunnels and do not allow the tunnel to collapse .

The temperature within the mine remains constant about 18-20 Celsius all over the year.

Within the mine, a stunning mosque prepared from different unique colors of rock salt bricks. Walls of Salt bricks when lightened give an attractive look. A big space called "Assembly Hall" measuring more than 240 feet height fascinates tourists. There are specific spaces fill up with saturated brine solution.

These pools when brightened with decorative lights give super appearance. There is an area of clear salt of bright pink color known as "Sheesh Mahal". Several compartments are linked with salt bridges above water pools.

Reflection of light in water pools displays outstanding shades of Rock Salt.

The Salt range in the khewra region has gypsum mineral deposits having 80-85 percentage of gypsum.

The gypsum found at this point is less white than another deposits in the country due to high level of impurities.

These mineral act as a protecting cover over the rock salt deposits in the mines. As it is less expensive and present in large amount, mining is performed by both PMDC (Pakistan mineral and Development Corporation) and mines rented to private companies.

The region has about 25 million tons of gypsum assets and about 0.5 million tons are extracted every year. Gypsum is mixed with other materials and chemicals which is then used in the manufacturing of cement, Plaster of Paris. About 25-30 gypsum treating plants mostly established by SMEs (Small and medium-sized enterprises) are situated, frequently on Khewra and Lilla roads.

Large number of these plants generate "Plaster of Paris (POP)" a hemihydrates type of gypsum and trade in the national bazaar. Plaster of Paris is used in dye, tiles, building, and in different sectors.

Quality and Composition of Khewra salt:

Salt found in khewra are of three types consist of

- Pink
- Red
- White

Salt originate from khewra are contain of sodium chloride Nacl 97.55% to 98.3% and besides salt also contain of minor quantity of calcium, magnesium, sulphate, and Potassium.

Chemical Composition of Salt:

Name	Sodium chloride as Nacl	Moisture %	Water insoluble %	Calcium Ca++ %	Magnesium Mg++ %	Sulfate SO4%	Potassium K+ %
Pinkish	98.30	0.11	0.40	0.30	0.12	0.28	0.046
Red salt	98.10	0.09	0.50	0.25	0.12	0.58	0.045

Khewra Salt Mines Project

White hard salt	97.55	0.12	0.80	0.20	0.12	0.25	0.800
White crystal salt	98.15	0.13	0.90	0.20	0.09	0.33	0.204

Name	Fe(mg/kg)	Zn(mg/kg)	Cu(mg/kg)	Mn(mg/kg)	Cr(mg/kg)	Pd(mg/kg)
Pinkish	0.24	0.12	0.00	0.00	0.36	0.10
Red salt	0.46	0.13	0.01	0.00	0.37	0.02
White hard salt	0.97	0.19	0.01	0.06	0.19	0.02
White crystal salt	0.48	0.20	0.03	0.00	0.37	0.03

Salt crystals are transparent and cubic in structure they typically look white however due to the contamination of different minerals may give them a blue or red shade.

The molar mass of salt is 58.4g/mole, the melting factor is 801 Celsius (1,474 Fahrenheit) and its boiling factor 1,465 Celsius (2,669 Fahrenheit). Its density is 2.17 grams for every cubic centimeter and it is naturally soluble in water.

While liquefied in H₂O it splits into Na⁺ and Cl⁻ ions, and the solubility is 359 grams for every liter.

Production:

The estimated total salt reserves in khewra salt mines is over 600 million tons.

Salt production from khewra in different years.

- During British rule the salt production from khewra salt mine is about 28,000 to 30,000 tons every year.
- During 1946-1947 salt production increase to 187,400 tons
- During 1949-1950 salt production was 136,824 tons.
- During 2003 salt production was 385,000 tons.
- During 2018-2019 salt production was 382,155 tons.

Tourism:

Due to the lot of attraction and beauty in khewra salt mine it attract large number of visitor. Approximately 250,000 visitor every year visit the khewra salt mine it include students, family and also foreign visitors.

PMDC earn huge amount of revenue from visitors in the form of tickets. PMDC charged following amount from visitors.

- Pakistani Adults Rs 120 per head
- Pakistani student Rs 60 per head
- Pakistani children(2 to 12 year) Rs 60 per head
- Foreign Adult 10 US dollars or equivalent per head
- Foreign student 5 US dollars or equivalent per head
- Foreign children 5 US dollars or equivalent per head
- Train charges up to the group of 12 people Rs 600
- Train charges for the group of more than 12 people Rs 60 per head

Timing for the tourist is from 9 A.m. to 6 P.m. including every Sunday and gazette holiday.

CHAPTER # 2

PMDC (Pakistan Mineral and Development Corporation):

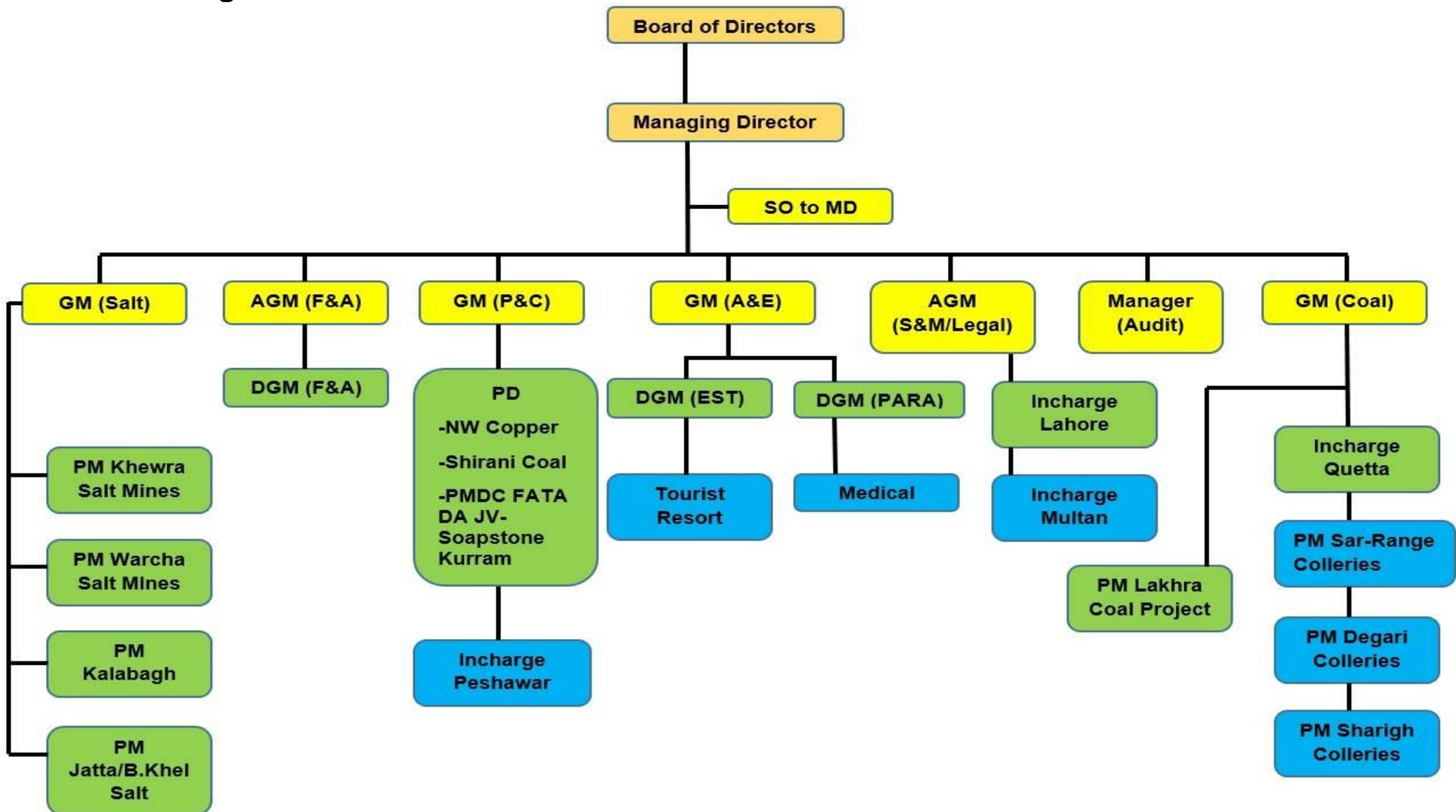
Khewra salt Mine project is administrated by Pakistan mineral development corporation Pakistan mineral and Development Corporation is an independent organization under the managerial control of Ministry of Petroleum and Natural Resources, Government of Pakistan.

It was founded in 1974 with an investment of Rs.1, 000 million to increase and support mineral improvement interests in the country.

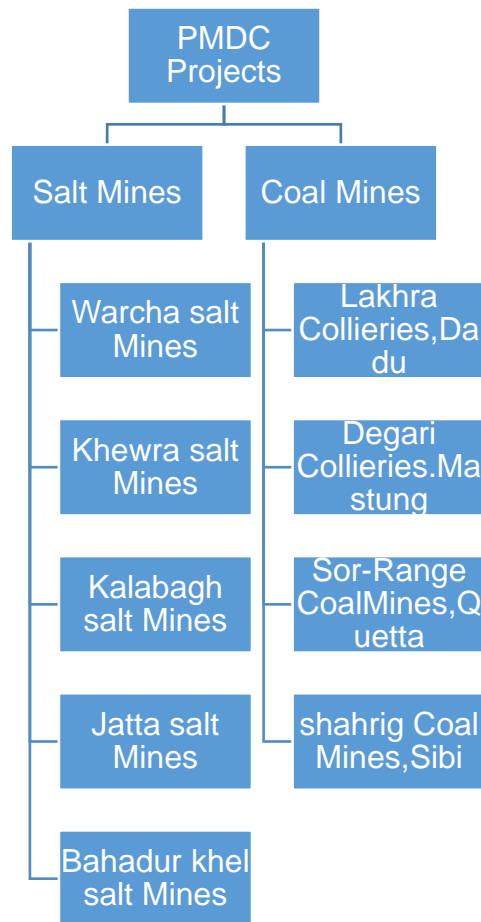
It is participating in surveys and calculation of cost effective mineral deposits, doing research and preparing feasibility reports both from technically and economical point of view.

PMDC is running four Coal Mines, four Salt Mines and a silica sand quarry. Pakistan mineral and Development Corporation contribute 17 percent of total coal production in the country and 58 percent of total salt production in the country.

PMDC Organization Chart:



Projects:



Warcha Salt mines:

Warcha is the village find in the north East of Quaidabad in Khushab District. It is one of the 51 Union Councils of Khushab District in the province of Punjab Pakistan. Warcha has salt mine. It is located 276 kilometers from Islamabad.

The salt appears in the manner of an asymmetrical and cracked salt ring. The colors of salt are normally white and pink. It is good for health and therefore it is largely used for cooking purposes. The transparency of salt originated from warcha salt mine is average 98 percent. The Mining technique exercised at warcha salt mine are Room and Pillar. The clean salt is white and shine like the crystal. The Warcha salt mine have 5 layers, with extreme width of 15 meters. The rented region of mine is 3,601.17 acres (Two Agreements). The Overall Assets are above 1 Billion tons.

Jatta Salt Mines:

Jatta salt Mines is situated 217 kilometers away from Islamabad or from Kohat. Salt originated from here is 98 percent pure. Different colors of salt including White, bright to black grey are found there.

Bahadurkhel Salt Mines:

Bahadurkhel is situated in the Bahadurkhel in KPK province Pakistan, it has projected 10.5 billion tons of salt reserves.

Lakhra Coal Mine:

Lakhra coal mine is situated in Sindh. Coal mine have estimated coal of 1.33 billion tons of coking coal. Coking coal is the coal that contains large amount of carbon contents in it.

Degari Collieries, Mastung:

Degari Collieries, Mastung coal assets are situated in 35 kilometers south-east of Quetta in the Geographical horizon of Eocene. Calorific value is the value of the energy generated when coal burns. Calorific value of coal is 4,830-6,060 Kcal/kg.

Sor-Range Coal Mines:

Sor-Range coal Mines, situated in 16 kilometers east of Quetta Baluchistan in the Geographical horizon of Eocene. Calorific value (Calorific value is the value of the energy generated when coal burns) of coal is 4,930-6,100 Kcal.

Shahrig Coal Mines:

Shahrig coal Mines, situated in 160 kilometers north-east of Quetta in the Geographical horizon of Eocene. Caloric value (Calorific value is the value of the energy generated when coal burns) of coal is 4,420-7,000 Kcal.

Role of the Labor in Khewra Salt Mine:

As the salt is extracted from the mine by the traditional method and labor played an important role in this method.

Number of labor are working within the mine to extract the salt. The average labor paid to the labor depends on the amount of salt he extract from the mine.

Normally 350/ton Pakistani rupee is the average labor rate. A person normally extract 2 tons of salt daily so he can earn Rs 700 daily by working as a labor in the mine.

People are working as labor from generation to generation in the khewra salt mine

Total number of worker registered with PMDC= 686 workers

Number of non-registered workers with PMDC=30-50 workers

PMDC give incentives to his registered workers and also Punjab labor welfare department provide funds to give education to the children's of workers.

A separate hospital is built for the worker to provide high quality of medical facility to worker. Which not only provide medical facility but also provide free medicine to the workers.

Miner's works in the groups. They called these groups as gangs. There are 30 gangs working at a time in different places within mine. Each gang is head by single person called as gang head. Each gang consist of 20-30 workers.

Worker are happy with working environment provided by PMDC. As PMDC wants to change the tradition mining method to modern mining method to increase the production of the salt. But worker feel fear about modern method as modern mining method can put their job at risk.

Mining Method:

Room and pillar method are used in khewra salt mine to extract the salt from the mines. In this process rooms are made to extract the salt and untouched salt which act as pillar are not disturbed it act as support.

The size and the shape of these pillar are very complicated process and required research and engineering to calculate the size of these pillar because these pillar are supporting and mine and avoid the mines to collapse.

The room and pillar method is also used in the extraction of Coal, iron, uranium, and gypsum

Following are the stage involved in room and pillar mining method.

Mine Layout:

Room and pillar method are established on a network base. Important factor is to determine the size of pillar. There are two important parameter in determining the size of pillar first is the load bearing capacity of the material (load bearing capacity is different for different materials) it is the amount of the load the material bear. Second important parameter is the amount of the material extracted from that area. Safety factor is also consider while designing the size of pillar and number of pillar because if one pillar fail the other pillar have to bear the weight of that pillar this result in the increase in the overall weight of pillar and thus a chain reaction of the pillar failure started. To avoid this Mine is divided in different planes or areas and these different planes are separated by barrier pillar. Barrier pillar are significant lager pillar and stop the chain reaction of pillar failure.

Mining:

There are different mining method. First is 'undercut' in which the deposit is cut and extracted from mine.

Second step is drilling and blasting method which is used in the khewra mines to extract salt. Small drilling machines and cutters are used to remove the unsymmetrical blocks of salt or a small hole is made by drill machine after drilling hole the hole is filled with explosive material and after blasting the salt rocks are broken in smaller pieces which is then extracted from mines through trolley.

Crushing of Salt:

After extraction the salt are grinded into crushing machines. These machines crush the large blocks of the salt into small pieces. This salt is further sent into another grinder from which the powder salt is produced.

During crushing process not all the salt is converted into powder form there are small stones are present in it this mixture is then passed through mesh from which these stones in 1 millimeter or 2 millimeter size are separated and sent to different industries such as leather industry used salt in leather processing.

Packing of Salt:

Powder salt is then mixed with small amount of iodine in it without the mixing of iodine salt is not allowed to sell in the market because deficiency of the iodine lead to goiter (enlargement of thyroid gland).

Different packing size are made varying from 50 kg to 1 kg. These packages are sold in the market which are available for human consumption.

Uses of Salt:

Only approximately 6% of salt is used for eating purpose 8% is consumed for de-icing the roads in winter season 12% is consumed for air conditioning process agriculture use of the salt is about 6 % of total salt production. Large amount of salt is used in manufacturing and process industry which 68% of total salt production.

Khewra salt is also used for the production of decorative salt lamps which show relaxing light when illuminated with light, besides lamps a number of decorative thing are made from salt mine and sell into local as well as in the international market.

Manufacturing of Crystal Rock Lamp:

The salt extracted from the khewra salt mine is in the form of blocks. These blocks are used to make different kind of decoration pieces. The main decoration piece that is made from the khewra salt mine blocks is Crystal salt lamp.

Following are the process involved in manufacturing of crystal rock lamp

Cutting:

Large pieces of salt blocks that are extracted from the mine are cut in to small pieces by using cutters. These cutters are fixed and water is used as lubricant to create the smooth cutting process also water absorbed the heat generated in this process.

Design Creation:

After cutting the salt into small pieces these pieces are then used further. Different kind of design are created which attract the customer and also looks good structurally.

Polishing of Lamp:

After making design on the salt rocks the next step is apply different kind of shiner due to which the lamp original color comes out and it start shinning.

Packing of the Lamp:

After applying polish the final stage is to pack the lamp in such a way that it cannot be broken down. And then finally pack the lamp in the boxes and sell into various markets of the country.

Benefits of Salt in our Diet:

Following are the benefits which we can obtain by using salt in our diet.

1. It regulates water levels in the human body.
2. It helps us in keeping and maintaining the healthy pH level.
3. It helps us in keeping healthy sugar levels of blood.
4. It acts as an anti-aging agent to keep the human body young.
5. Cellular energy stability is achieved by using salt.
6. It helps us in assisting vascular health.
7. It helps generally to improve our health.
8. It also helps in maintaining healthy sleep patterns.
9. It helps in encouraging healthy libido.
10. It helps and promotes kidney and also gallbladder health.

Salt Producing Countries:

Following are the top six salt production countries

1. China (Producing 68 million tons)
2. The United States (Producing 42 million tons)
3. India (Producing 29 million tons)
4. Germany (Producing 13 million tons)
5. Canada (Producing 13 million tons)
6. Australia (Producing 12 million tons)

Pakistan stands on 20th position among the exporters because Pakistan cannot export its salt in fine quality to the international market; it only exports salt in the raw form and India uses this raw salt and converts it into fine quality salt and earns a lot of revenue from it.

Review of BULC Trip to Khewra Salt Mines:

Introduction:

Our university arranged a study tour to khewra salt mines on 7 December 2019. This tour also the part of our project. We have to plan the activities by using primavera P-6.

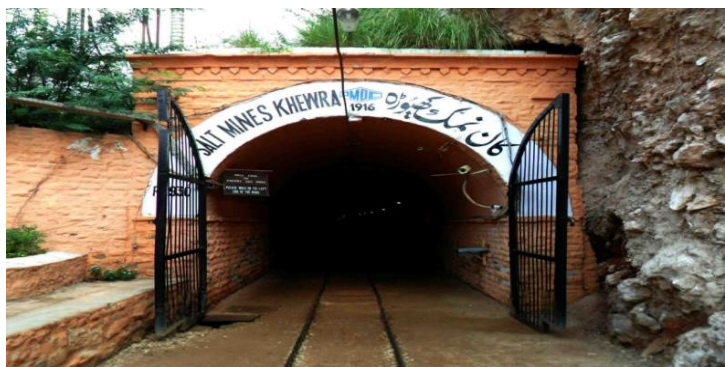
As number of activities are performed in the khewra mines. We have to insert minimum 50 activities in the primavera and add resources also add the cost related to the activities and submit the minimum 40 page report.

Our experience to the khewra mines was outstanding. A quality time spent during travelling with friends and also visiting khewra salt mines. During our visit we absorb number of things within the mines some of these things are described below.

Khewra salt mines is the 2nd largest mines contain such a large amount of salt reserves within itself. At present the khewra salt mines is under federal government control. PMDC a federal government organization administrate the khewra salt mines.

After reaching the khewra salt mines we enter in the mine train service is available to go inside the khewra salt mines for the visitor but unfortunately due to the large number of visitors.

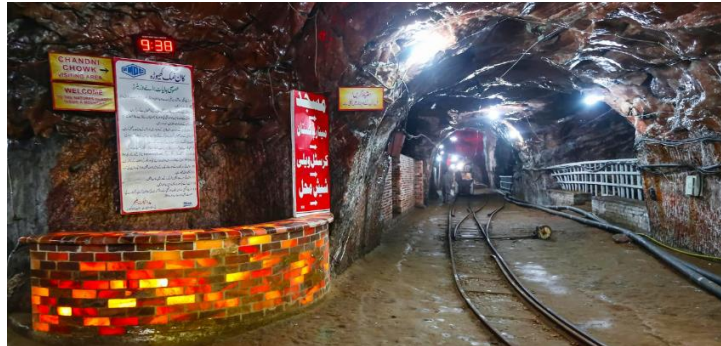
Entering Point to Mine:



The main tunnel is used as entering point inside the khewra mine. Normally an electric train is used for the visitors to visit the mines. But when large number of visitor visit you have to wait for the train for long time therefore some visitors walk in to visit the mine.

Chandni Chowk:

After entering walking straight inside the mine approximately half kilometer you find a beautiful chowk name as Chandni chowk



Brine Ponds:

Within the mine there are some cavities filled by saturated brine mixture. The salted water leaks in mine walls and also through roof and stores into these cavities by time. There are numerous such water-saturated cavities within the mine but it is not possible to view these cavities in the dim light. Just two such pools have been lightened for visitors.



Badshahi Mosque:

Within the main tunnel a beautiful mosque is built in the mine. This Mosque is named as badshahi masjid. Badshahi masjid is built with different color of salt bricks. Different

shades of salt bricks are used which include Red, pink and white shade. These salt brick are illuminated by electric blubs which present the stunning view for mosque.



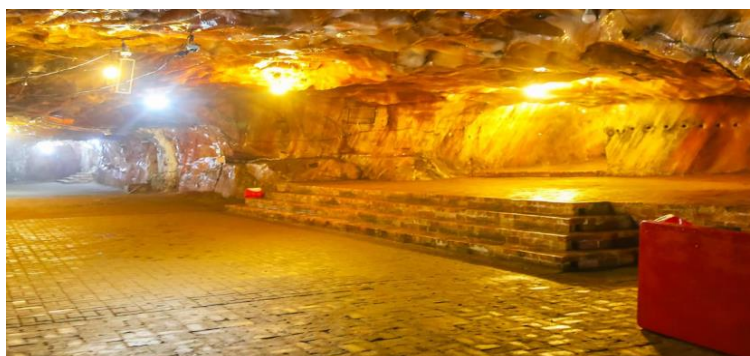
Minar-e- Pakistan:

Minar-e- Pakistan model is made within the mines. This model is also made of different colors and illuminated with light bulbs to present an outstanding view to the visitors.



Sheesh Mahal:

The stunning Sheesh Mahal, or the fortress of glasses, is additional charm in the mines and walls prepared of visible salt and water pools lightened with bright bulbs. The lightened ponds and cavities have been linked by bridges prepared of salt.



Salt Crystal Growths:

Salt crystal creations exist in the mine and are a large visitor attraction. A number of these crystals look like they are growing upwards starting from the earth however others hang from the rooftop. One such development proceeds slowly and takes many years to form so it is extremely important that visitors don't destroy them.



Emergency Dispensary:

Emergency dispensary prepared of salt blocks within the Khewra Salt Mines. Different shades of salt block or bricks are used including pink and white. These blocks are also illuminated with light bulbs to attract the visitors.



Pakistan Post Office:

A post office is constructed inside the Khewra mine by the Pakistan Post. The postal code or address of this post office is 48530. This post office is performing its operation and you can send post mail to this post office from all over the world.

Electric Railway:

Electric train carries people from entrance to a footpath junction about 500m within the channel. External to the tunnel you can also realize wild rails and little train carriages used to extract salt since 1930s.

This train was used in the past to bring the extracted salt out from the mine but now it is used for tourists to visit the mine.



Asthma Clinic:

Asthma Clinic in Khewra Salt Mines is the first kind of clinic in Pakistan which is located inside the salt mine. Salt particles act as antibacterial and these salt particles sterilized environment means make it free from bacteria, people having problem in breathing come here. This air cleans their respiratory system. Asthma patients get benefits by visiting this clinic. Patients have to spend approximately 110 hours in this clinic during the period of 10 days of treatment. This treatment costs Rs6,300 approximately.

According to senior doctor who is serving patients in asthma clinic, say that no need to use medicines. Patients just have to come here and spend few days in this clinic to get treatment.

“Percentage of recovery in the young’s is 70 to 80%, and the patients having age above 40 the percentage of their recovery is 50%.”

CHAPTER # 3

Primavera P-6:

Overview:

Primavera P-6 Professional Project Management provides project managers and project team full control on the project which is very essential to complete the project successfully. Primavera P-6 Professional Project Management, is created in such a way that is able to handle big-scale, extremely complex, and complicated projects. It can handle and manage approximately 100,000 activities, you can use unlimited number of resources add new resources and also use existing resources Different resources including labor resources, non-labor resources and equipment resources(include machinery ,different tools).

Primavera P-6 is used for planning, scheduling of project activities.

Scheduling:

Primavera P-6 contains highly developed scheduling solutions. First you have to create the project then WBS and under WBS you can create Project activities. Then you add relationship between activities decide the successor and predecessor of the activities. Then you can schedule the project by using scheduling tools.

Resource and Cost Control Management:

You can assign different resources to the activities you can use the existing resources and also add new resources to the activities. You can also add or change the cost associated with these resources and after assigning all resources to the activities you can calculate the budgeted cost of the project.

Risk Management:

You can easily identify and add risk to the activities. Risks can be allocated to the activities and you can perform risk analysis for each activity.

Contract Management:

To complete the project within time and also within budget a project manager should have complete control on project. Contract management in primavera increase the speed and also give complete control on the project budget and on project schedule.

Reporting:

Primavera P-6 also have developed reporting feature you can also use report that is already existing in data base and also create new report according to the requirement of customer.

List of Activities for Khewra Salt Mine Project:

In our visit to khewra salt mine. We observe the following activities in khewra salt mine project and we have prepared a project plan for developing a new mine at khewra which will be started from feasibility to handing over the project to PMDC. The activities will be briefly explained below.

Following are the activities.

Feasibility Study:

The feasibility study of the project will be prepared at the suitable site as per requirements.

- **Survey of Land:**

The survey of land is carried out with help of instruments to mark the location and topography survey of the land.

- **Selection of Land:**

The land allotted by the government will be identified and marked accordingly.

- **Testing of Land:**

Testing of land will be carried out with boreholes or SPT to study the condition of the soil strata beneath it.

- **Quality and Quantity of Mineral:**

The quality of the mineral is first specified and its quantity should be measured approx to justify the need of the project.

- **Underground Strata Conditions:**

The soil strata condition will be observed for suitable mining method.

- **Method of Mineral Extraction:**

Room and Pillar method will be best suited for the rock salt mine.

- **Number of Levels and Shafts with Length to be driven:**

It is to be further justified that how much levels and shaft will be used to dive the salt out.

- **Plant and Machinery Required:**

List will be prepared for the required equipment to be used in the mining process.

- **Details of Infrastructure to be established:**

Separate list is to be prepared that shows the need of the infrastructure to be established around the mine.

- **Environmental Analysis:**

The most important process is the study of environmental analysis.

Procurement of services:

We will be initiating a tendering process for the procurement of different services.

- **Tender Process:**

Tendering will be initiated according for the services as required.

- **Bid Opening & Evaluation:**

Bid submitted by the vendors are studied and short listed as pre requirements.

- **Vendor Selection:**

Vendors will be selected as per demand of the project.

- **Consultant Services:**

Design and Consultant services will be adopted to measure the extent of the mining methods and its limitations.

- **Office and Housing Colony:**

Offices and housing colonies for the staff and workers are first prepared before commencement of work at site.

- **Power House:**

A power supply mechanism to be installed to the need full of the project.

- **Health & Safety Services:**

Hospitals/Dispensaries should be prepared to avoid any major injuries.

- **Site Store:**

Site store stacking area will be identified and proper placing of site equipment.

- **Hiring of Resources:**

Resources will be hired and designated to their special task.

- **Inspection:**

Inspection of all the procurement will be carried out by the senior management.

Procurement of Equipment's:

We will be initiating a tendering process for the procurement of different material/equipment.

- **Tender Process:**

Tendering will be initiated according for the services as required.

- **Bid Opening & Evaluation:**

Bid submitted by the vendors are studied and short listed as per requirements.

- **Vendor Selection:**

Vendors will be selected as per demand of the project.

- **Rail Lines:**

The dispatched rock salt will be taken out of mine through rail line which will be initiated by a separate vendor.

- **Locomotive:**

The locomotive will be installed on the rail line to transport the material outside of the mine.

- **Dumper/ Trucks:**

The trucks will be used to transport the material from mine to the crusher plant.

- **Water Supply:**

The water supply resources will be furnished on the site as per demand of the project.

- **Electrical Supply:**

The water supply resources will be furnished on the site as per demand of the project.

- **Safety Gadgets:**

The safety gadgets will be procured as per safety plan.

- **Rescue Station / Operations:**

A firefighting station will be established at site to avoid any serious fire at mine.

- **Explosives:**

The explosive for mine digging will be procured as per Govt regulations.

- **Mine Safety Material:**

Mine safety material that will be used for mine safety will be procured like wood and steel plates.

- **Inspection:**

The trucks will be used to transport the material from mine to the crusher plant.

Mining:

The process of mining will be executed from layout to digging the salt out of the mine.

- **Layout of Mine:**

Layout of mine is first initiated with the help of total station with proper bearing will be provided.

- **Drilling of Rocks:**

Drilling in the rocks will be proceeded to adjust the explosive inside of the mine.

- **Placing of Explosives:**

Explosives will be placed carefully in the drills holes.

- **Detonator Adjustment:**

The detonator time will be adjusted so that every human should be in safe area.

- **Collection of Explode Rocks:**

The rock salt will be collected with the help of wheel barrow.

- **Stacking of Rock Salts as per Sizes:**

The rocks are staked close to mine outlet as per size variation.

- **Protection of Mine:**

After explosive is made the mine should be inspected by the engineers to avoid any collapsing in the mine or use alternate method to eliminate it.

- **Electrification of Mine:**

The mine will awaked using light insight and close the mining area.

- **Mine Ventilation:**

Mine should be designed in such a way that it should ventilated properly.

- **Emergency Exit:**

Emergency exit should be provided in the mine to safely dig the workers out of the mine in case of any emergency.

Processing of Salt:

The rock salt exploded out of the mine will be sent for processing units by trucks.

- **Transportation of Salts from Mine:**

The trucks will be used to carry the material out of the mine.

- **Screening of Salt Lumps:**

In processing plant a screener is provided or manual screening will be used by labor to separate the rock salt as per sizes.

- **Separation of Hard Rock Salts for Monuments:**

Large hard rock elements will be separated for monuments making.

- **Crushing:**

Soft rocks are crushed to small units by crusher.

- **Sieve Analysis:**

A sieve separator is provided in the processing plant to differ the size of the salt.

Packaging:

A packaging plant is to be established near the processing plant to pack the salt.

- **Coarse Particles for Commercial:**

Large size particle (<3mm) will be used for textile and other purposes.

- **Fine Particles for Household:**

Fine powder form particle will be used for household with addition of iodine in it.

- **Inventory/Marketing:**

After packaging the samples are brought to the distributors.

- **Storage of Salts in Warehouse:**

The salt bags are placed in ware house and staked properly to avoid moisture.

- **Distribution:**

The distributors will release the salt as per demand.

Testing and Commissioning:

After completion 6 months in operation of the mine the testing process will be inquired.

- **Patrolling:**

The senior management will used the patrolling method to observe any quires in the process.

- **Emergency Exit Testing:**

The testing of EM exit will be carried out.

- **Mine Safety Testing:**























The safety of mine will be tested as per regulation and labor law.



Handing/Taking:

- **Handing over to PMDC:**

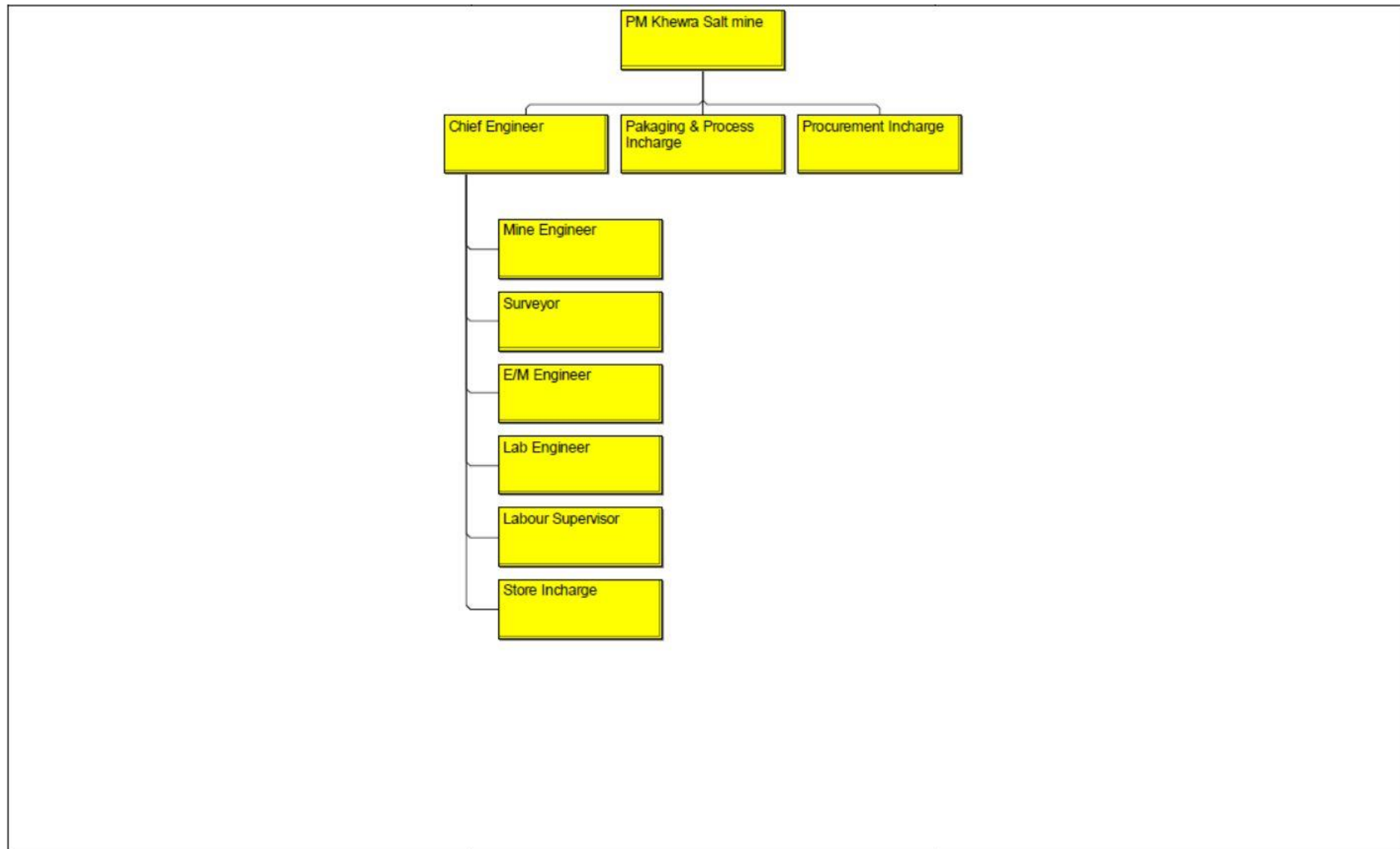
The senior will arrange a seminar to handover the mine to PAKISTAN MINERAL DEVELOPMENT CORPORATION which further on can rent out the mine to any contractor or can personally operate the mine.

Resources Sheet Khewra Salt Mines Project on P-6:

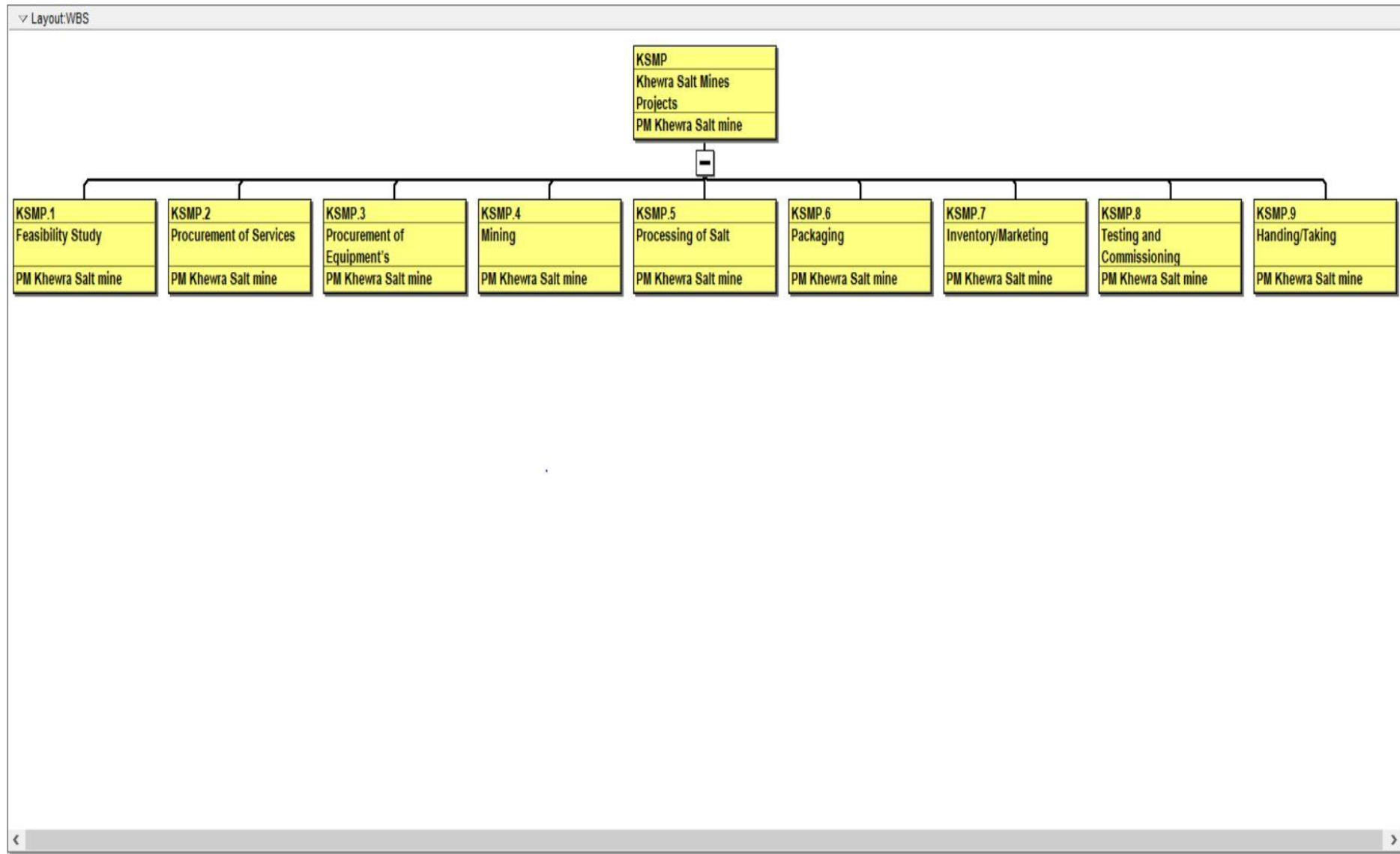
Resource ID	Resource Name	Resource Type	Unit of Measure	Standard Rate	Default Units/
 R	Surveyor	Labor		Rs1,500/h	1 d/d
 R-1	PM	Labor		Rs5,000/h	1 d/d
 R-2	Chief Engineer	Labor		Rs3,000/h	1 d/d
 R-3	Mine Engineer	Labor		Rs3,000/h	1 d/d
 R-4	EM Engineer	Labor		Rs3,000/h	1 d/d
 R-5	Lab Engineer	Labor		Rs3,000/h	1 d/d
 R-6	Labour Supervisor	Labor		Rs1,500/h	1 d/d
 R-7	Store Incharge	Labor		Rs1,500/h	1 d/d
 R-8	Pakaging & Process Incharge	Labor		Rs4,000/h	1 d/d
 R-9	Procurement Incharge	Labor		Rs4,000/h	1 d/d
 R-10	Total Station	Nonlabor		Rs1,200/h	1 d/d
 R-11	Laboratory Instruments	Nonlabor		Rs3,000/h	1 d/d
 R-12	Enviomment Cunsultant	Labor		Rs2,500/h	1 d/d
 R-13	Tendering Staff	Labor		Rs3,200/h	1 d/d
 R-14	Mine Cunsultant	Labor		Rs6,000/h	1 d/d
 R-15	Site Engineer	Labor		Rs1,500/h	1 d/d
 R-16	Bricks	Material	Each	Rs8/ea	8ea/d
 R-17	Cement	Material	Packs	Rs600/Pack	8Pack/d
 R-18	Rail line	Material	Lump Sum	Rs1,000,000/LS	8LS/d
 R-19	Locomotive	Material	Lump Sum	Rs500,000/LS	8LS/d
 R-20	Dumper	Nonlabor		Rs250/h	1 d/d
 R-21	Truck	Nonlabor		Rs250/h	1 d/d

	R-21	Truck	Nonlabor		Rs250/h	1 d/d
	R-22	Water Supply	Material	Linear feet	Rs22/LF	8LF/d
	R-23	Electric Supply	Material	Square Feet	Rs30/Sft	8Sft/d
	R-24	Safety Gadgets	Material	Each	Rs1,000/ea	8ea/d
	R-25	Explosive	Material	Each	Rs700/ea	8ea/d
	R-26	Mine Safety	Material	Square Feet	Rs90/Sft	8Sft/d
	R-27	Hilt/Drill	Nonlabor		Rs150/h	1 d/d
	R-28	Process Plant	Nonlabor		Rs300/h	1 d/d
	R-29	Packging Plant	Nonlabor		Rs250/h	1 d/d
	R-30	Mason	Labor		Rs200/h	1 d/d
	R-31	Labour	Labor		Rs100/h	1 d/d
	R-32	Electrician	Labor		Rs200/h	1 d/d
	R-33	Plumber	Labor		Rs200/h	1 d/d
	R-34	Marketing Cunsultant	Labor		Rs230/h	1 d/d
	R-35	Wheel Barrow	Nonlabor		Rs20/h	1 d/d

OBS for Khewra Salt Mines Project on P-6:



WBS of Khewra Salt Mines Project on P-6:



Activity Table fir Khewra Salt Mines Project on P-6:

Activities						
Layout: Classic Schedule Layout		Filter: All Activities				
Activity ID	Activity Name	Original Duration	Start	Finish	Resources	Budgeted Total Cost
KSMP Khewra Salt Mines Projects		314d	01-Jan-20 A	31-Dec-20		Rs34,275,480
A1000	Project Start	0d	01-Jan-20			Rs0
KSMP.1 Feasibility Study		42d	01-Jan-20 A	18-Feb-20		Rs3,832,000
A1010	Survey of Land	10d	01-Jan-20 A	11-Jan-20	Surveyor, Labour, Total Station	Rs224,000
A1020	Selection of Land	5d	13-Jan-20 A	17-Jan-20	Surveyor, Chief Engineer, PM	Rs380,000
A1030	Testing of Land	7d	13-Jan-20 A	20-Jan-20	Laboratory Instruments, Lab Engineer	Rs336,000
A1040	Quality and Quantity of Mineral	8d	21-Jan-20	29-Jan-20	Lab Engineer, Mine Engineer, Laboratory Instruments	Rs576,000
A1050	Underground Strata Conditions	10d	30-Jan-20	10-Feb-20	Mine Engineer, Laboratory Instruments, Enviornment Consultant	Rs680,000
A1060	Method of Mineral Extraction	2d	30-Jan-20	31-Jan-20	Mine Consultant, Mine Engineer, Chief Engineer	Rs192,000
A1070	Number of Levels and Shafts to be Driven	6d	30-Jan-20	05-Feb-20	Mine Engineer, Mine Consultant	Rs432,000
A1080	Plant and Machinery Required	3d	06-Feb-20	08-Feb-20	Chief Engineer, Mine Consultant	Rs216,000
A1090	Details of Infrastructure to be Established	8d	06-Feb-20	14-Feb-20	Chief Engineer, Mine Engineer, E/M Engineer	Rs576,000
A1100	Environmental Analysis	11d	06-Feb-20	18-Feb-20	Enviornment Consultant	Rs220,000
KSMP.2 Procurement of Services		53d	19-Feb-20	20-Apr-20		Rs11,678,200
A1110	Tender Process	10d	19-Feb-20	29-Feb-20	Tendering Staff, PM, Chief Engineer	Rs896,000

Activities							
Layout: Classic Schedule Layout		Filter: All Activities					
Activity ID	Activity Name	Original Duration	Start	Finish	Resources	Budgeted Total Cost	
KSMP.2	Procurement of Services	53d	19-Feb-20	20-Apr-20		Rs11,678,200	
A1110	Tender Process	10d	19-Feb-20	29-Feb-20	Tendering Staff, PM, Chief Engineer	Rs896,000	
A1120	Bid Opening & Evaluation	10d	02-Mar-20	12-Mar-20	PM, Tendering Staff	Rs656,000	
A1130	Vendor Selection	10d	13-Mar-20	24-Mar-20	Mine Consultant, PM	Rs880,000	
A1140	Consultant Services	12d	25-Mar-20	07-Apr-20	PM, Chief Engineer, Mine Engineer	Rs1,056,000	
A1150	Office and Housing Colony	7d	25-Mar-20	01-Apr-20	Bricks, Cement	Rs6,400,000	
A1160	Power House	8d	25-Mar-20	02-Apr-20	Electrician, Labour, Electric Supply	Rs94,200	
A1170	Health & Safety Services	8d	25-Mar-20	02-Apr-20	Mine Engineer, Store Incharge, Procurement Incharge	Rs544,000	
A1180	Site Store	10d	25-Mar-20	04-Apr-20	Store Incharge, Procurement Incharge	Rs440,000	
A1190	Hiring of Resources	8d	06-Apr-20	14-Apr-20	PM, Chief Engineer	Rs512,000	
A1200	Inspection	5d	15-Apr-20	20-Apr-20	PM	Rs200,000	
KSMP.3	Procurement of Equipment's	45d	21-Apr-20	11-Jun-20		Rs11,789,600	
A1210	Tender Process	5d	21-Apr-20	25-Apr-20	Tendering Staff, PM, Chief Engineer	Rs448,000	
A1220	Bid Opening & Evaluation	3d	27-Apr-20	29-Apr-20	PM, Tendering Staff	Rs196,800	

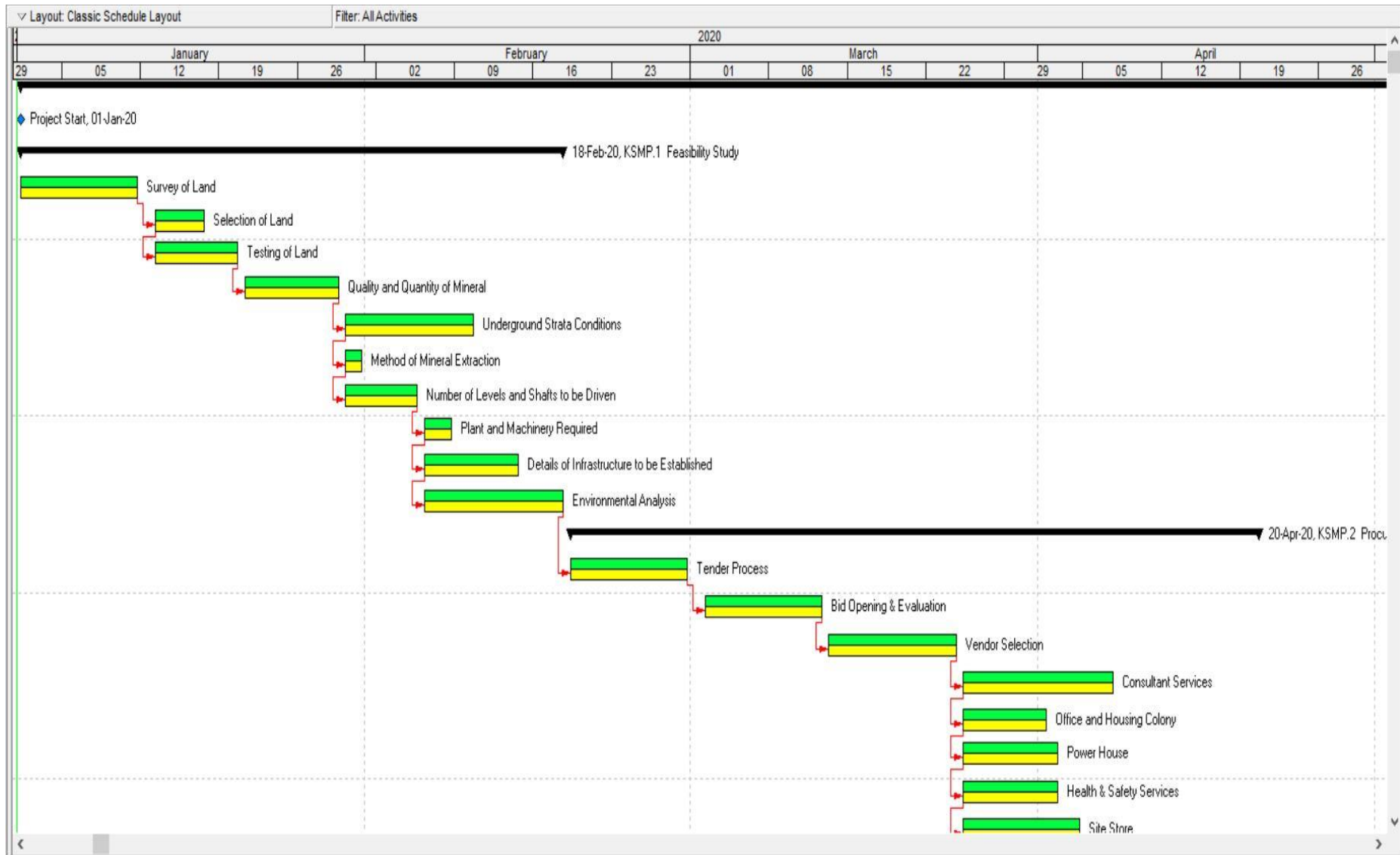
Activities						
Layout: Classic Schedule Layout		Filter: All Activities				
Activity ID	Activity Name	Original Duration	Start	Finish	Resources	Budgeted Total Cost
KSMP.3 Procurement of Equipment's		45d	21-Apr-20	11-Jun-20		Rs11,789,600
A1210	Tender Process	5d	21-Apr-20	25-Apr-20	Tendering Staff, PM, Chief Engineer	Rs448,000
A1220	Bid Opening & Evaluation	3d	27-Apr-20	29-Apr-20	PM, Tendering Staff	Rs196,800
A1230	Vendor Selection	3d	30-Apr-20	02-May-20	PM, Tendering Staff	Rs196,800
A1240	Rail Lines	12d	30-Apr-20	13-May-20	Rail line	Rs1,000,000
A1250	Locomotive	18d	30-Apr-20	20-May-20	Locomotive	Rs500,000
A1260	Dumper/ Turks	8d	30-Apr-20	08-May-20	Dumper, Truck, Store Incharge	Rs128,000
A1270	Water Supply	15d	09-May-20	26-May-20	Water Supply	Rs110,000
A1280	Electrical Supply	14d	27-May-20	11-Jun-20	Electric Supply	Rs144,000
A1290	Safety Gadgets	3d	27-May-20	29-May-20	Safety Gadgets	Rs4,000,000
A1300	Rescue Station / Operations	13d	27-May-20	10-Jun-20	Procurement Incharge, PM	Rs936,000
A1310	Explosives	3d	27-May-20	29-May-20	Explosive	Rs3,150,000
A1320	Mine Safety Material	3d	27-May-20	29-May-20	Mine Safety	Rs900,000

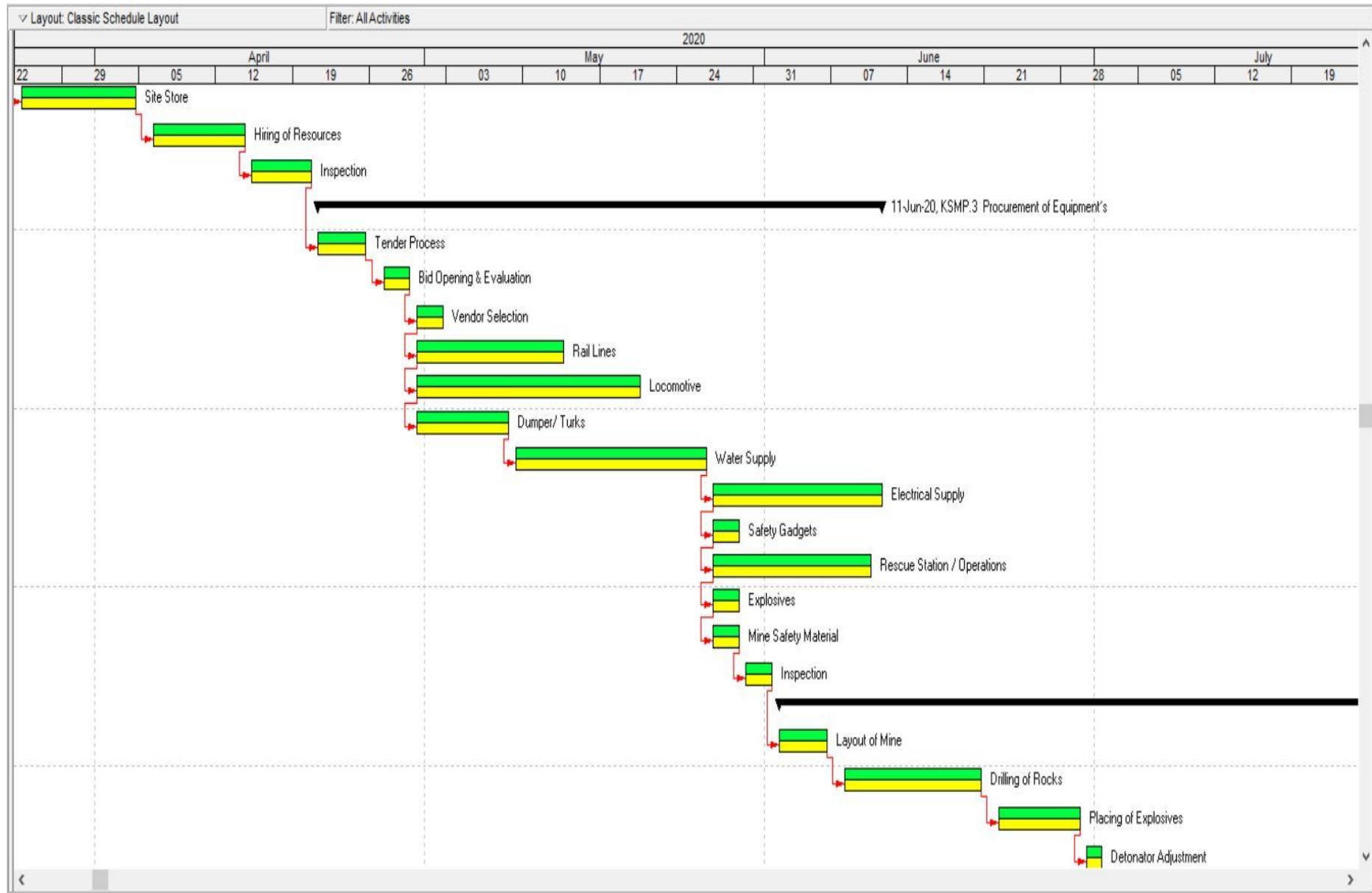
Activities						
Layout: Classic Schedule Layout		Filter: All Activities				
Activity ID	Activity Name	Original Duration	Start	Finish	Resources	Budgeted Total Cost
A1320	Mine Safety Material	3d	27-May-20	29-May-20	Mine Safety	Rs900,000
A1330	Inspection	2d	30-May-20	01-Jun-20	PM	Rs80,000
KSMP.4	Mining	88d	02-Jun-20	11-Sep-20		Rs3,414,240
A1340	Layout of Mine	5d	02-Jun-20	06-Jun-20	Mine Engineer, Labour Supervisor, Site Engineer, Labour	Rs244,000
A1350	Drilling of Rocks	12d	08-Jun-20	20-Jun-20	Labour, Mine Engineer, Site Engineer, Hilti/Drill	Rs456,000
A1360	Placing of Explosives	7d	22-Jun-20	29-Jun-20	Mine Engineer, Labour	Rs173,600
A1370	Detonator Adjustment	2d	30-Jun-20	01-Jul-20	Labour, Mine Engineer	Rs49,600
A1380	Collection of Explode Rocks	4d	02-Jul-20	06-Jul-20	Labour, Labour Supervisor, Wheel Barrow	Rs51,840
A1390	Stacking of Rock Salts as per Sizes	12d	07-Jul-20	20-Jul-20	Labour Supervisor, Labour	Rs153,600
A1400	Protection of Mine	14d	21-Jul-20	05-Aug-20	Mine Consultant, Mine Engineer	Rs1,008,000
A1410	Electrification of Mine	13d	06-Aug-20	20-Aug-20	E/M Engineer, Electrician, Electric Supply	Rs512,800
A1420	Mine Ventilation	9d	21-Aug-20	31-Aug-20	Mason, Labour, Mine Engineer, Site Engineer, Bricks	Rs348,800

Activities						
Layout: Classic Schedule Layout		Filter: All Activities				
Activity ID	Activity Name	Original Duration	Start	Finish	Resources	Budgeted Total Cost
A1420	Mine Ventilation	9d	21-Aug-20	31-Aug-20	Mason, Labour, Mine Engineer, Site Engineer, Bricks	Rs348,800
A1430	Emergency Exit	10d	01-Sep-20	11-Sep-20	Site Engineer, Mine Engineer, Mason, Labour, Bricks	Rs416,000
KSMP.5	Processing of Salt	29d	12-Sep-20	15-Oct-20		Rs680,400
A1440	Transportation of Salts from Mine	3d	12-Sep-20	15-Sep-20	Truck, Site Engineer	Rs42,000
A1450	Screening of Salt Lumps	16d	16-Sep-20	03-Oct-20	Pakaging & Process Incharge, Process Plant	Rs550,400
A1460	Separation of Hard Rock Salts for Monuments	3d	05-Oct-20	07-Oct-20	Process Plant, Labour Supervisor, Labour	Rs45,600
A1470	Crushing	2d	08-Oct-20	09-Oct-20	Process Plant, Labour Supervisor, Labour	Rs30,400
A1480	Sieve Analysis	5d	10-Oct-20	15-Oct-20	Process Plant	Rs12,000
KSMP.6	Packaging	16d	16-Oct-20	03-Nov-20		Rs928,000
A1490	Coarse Particles for Commercial	8d	16-Oct-20	24-Oct-20	Packging Plant, Pakaging & Process Incharge, Mine Engineer	Rs464,000
A1500	Fine Particles for Household	8d	26-Oct-20	03-Nov-20	Mine Engineer, Packging Plant, Pakaging & Process Incharge	Rs464,000
KSMP.7	Inventory/Marketing	21d	04-Nov-20	27-Nov-20		Rs145,040
A1510	Storage of Salts in Warehouse	8d	04-Nov-20	12-Nov-20	Store Incharge, Marketing Consultant	Rs110,720

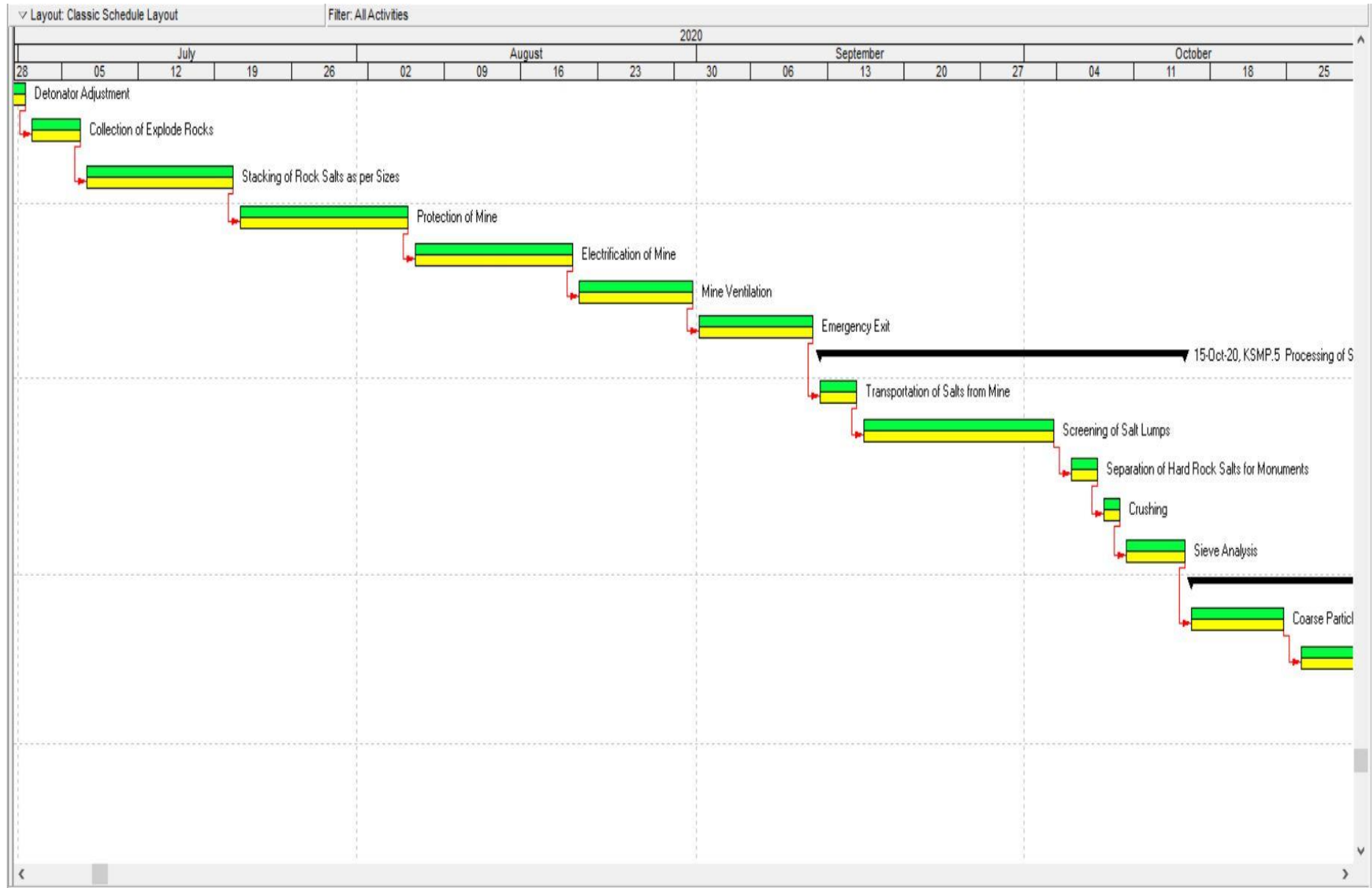
Activities						
Layout: Classic Schedule Layout		Filter: All Activities				
Activity ID	Activity Name	Original Duration	Start	Finish	Resources	Budgeted Total Cost
KSMP.6	Packaging	16d	16-Oct-20	03-Nov-20		Rs928,000
A1490	Coarse Particles for Commercial	8d	16-Oct-20	24-Oct-20	Packging Plant, Pakaging & Process Incharge, Mine Engineer	Rs464,000
A1500	Fine Particles for Household	8d	26-Oct-20	03-Nov-20	Mine Engineer, Packging Plant, Pakaging & Process Incharge	Rs464,000
KSMP.7	Inventory/Marketing	21d	04-Nov-20	27-Nov-20		Rs145,040
A1510	Storage of Salts in Warehouse	8d	04-Nov-20	12-Nov-20	Store Incharge, Marketing Cunsultant	Rs110,720
A1520	Distribution	13d	13-Nov-20	27-Nov-20	Marketing Cunsultant, Labour	Rs34,320
KSMP.8	Testing and Commissioning	19d	28-Nov-20	19-Dec-20		Rs1,408,000
A1530	Patrolling	7d	28-Nov-20	05-Dec-20	PM, Chief Engineer	Rs448,000
A1540	Emergency Exit Testing	4d	07-Dec-20	10-Dec-20	PM, Chief Engineer	Rs256,000
A1550	Mine Safety Testing	8d	11-Dec-20	19-Dec-20	PM, Chief Engineer, Mine Engineer	Rs704,000
KSMP.9	Handing/Taking	10d	21-Dec-20	31-Dec-20		Rs400,000
A1560	Handing Over to PMDC	10d	21-Dec-20	31-Dec-20	PM	Rs400,000
A1570	Project End	0d		31-Dec-20		Rs0

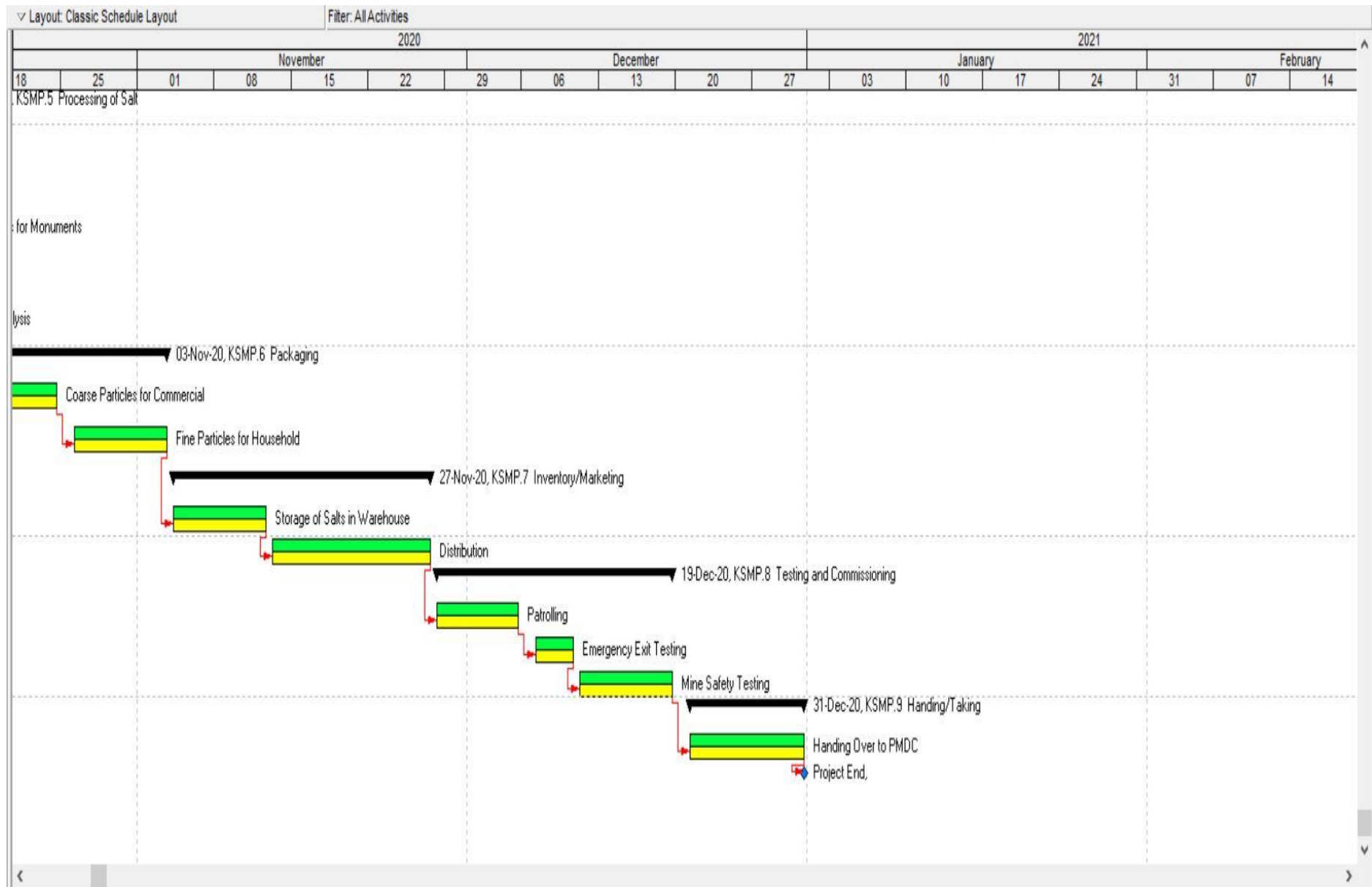
Ghant Chart for Khewra Salt Mines Project on P-6:



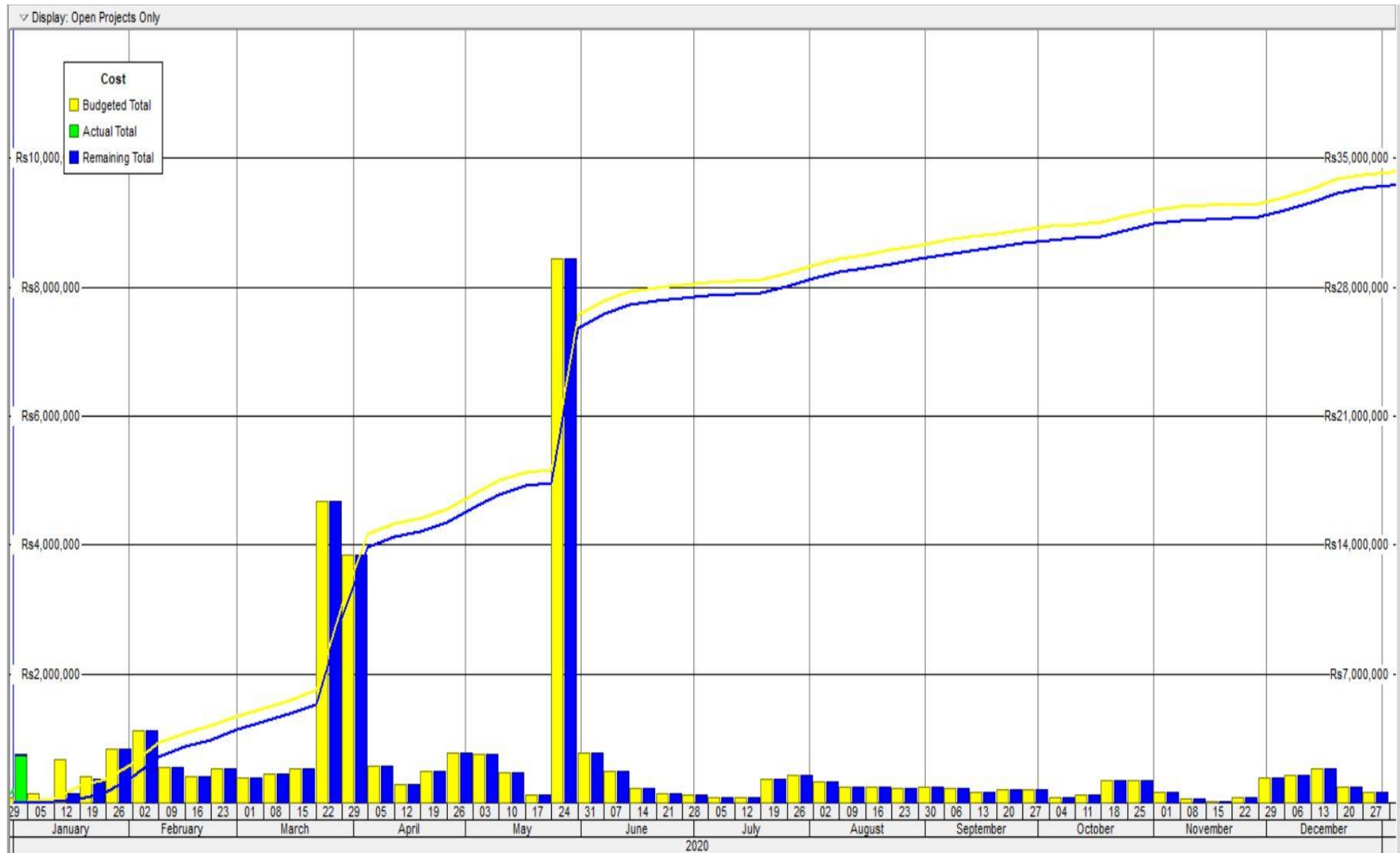


Khewra Salt Mines Project

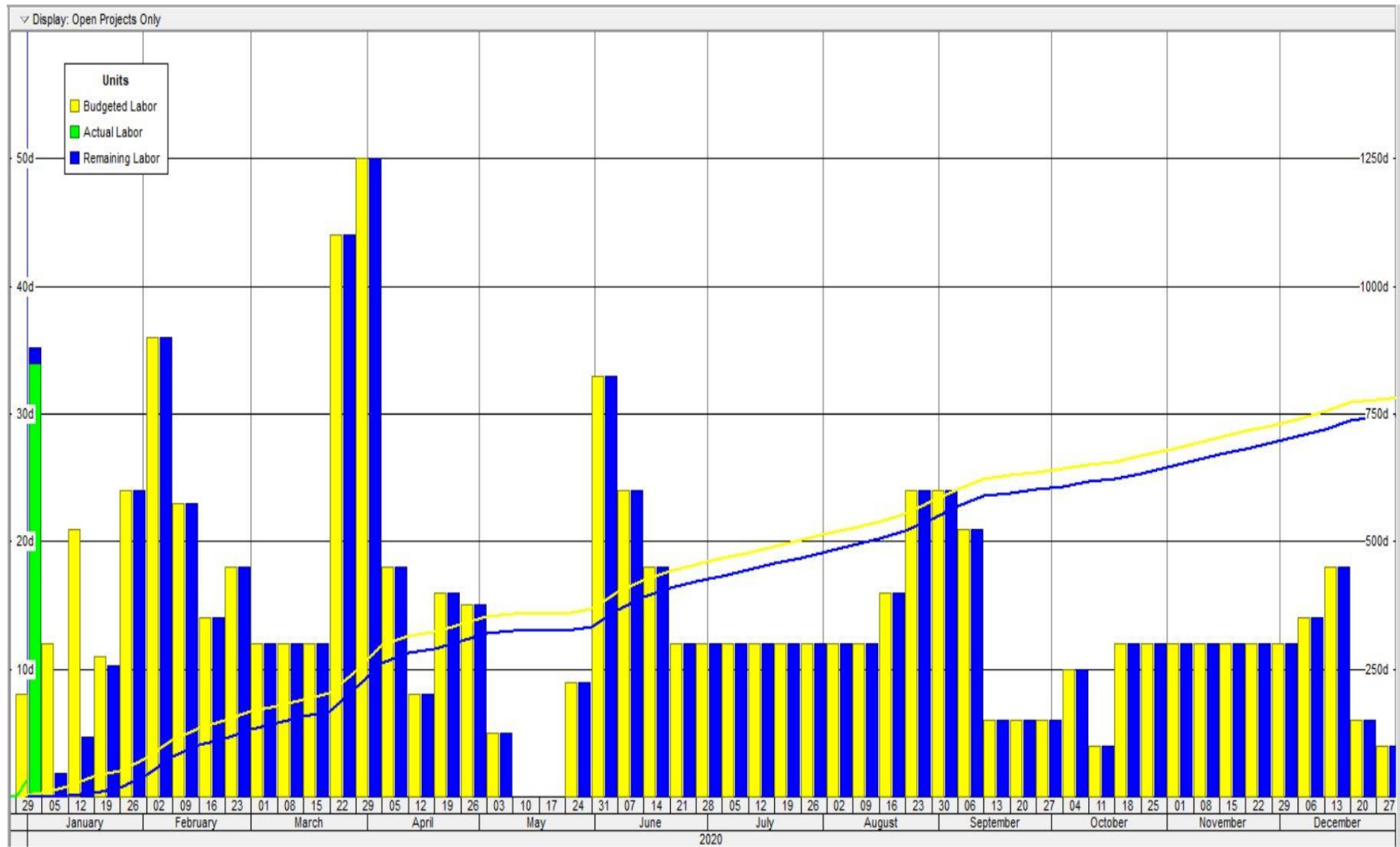




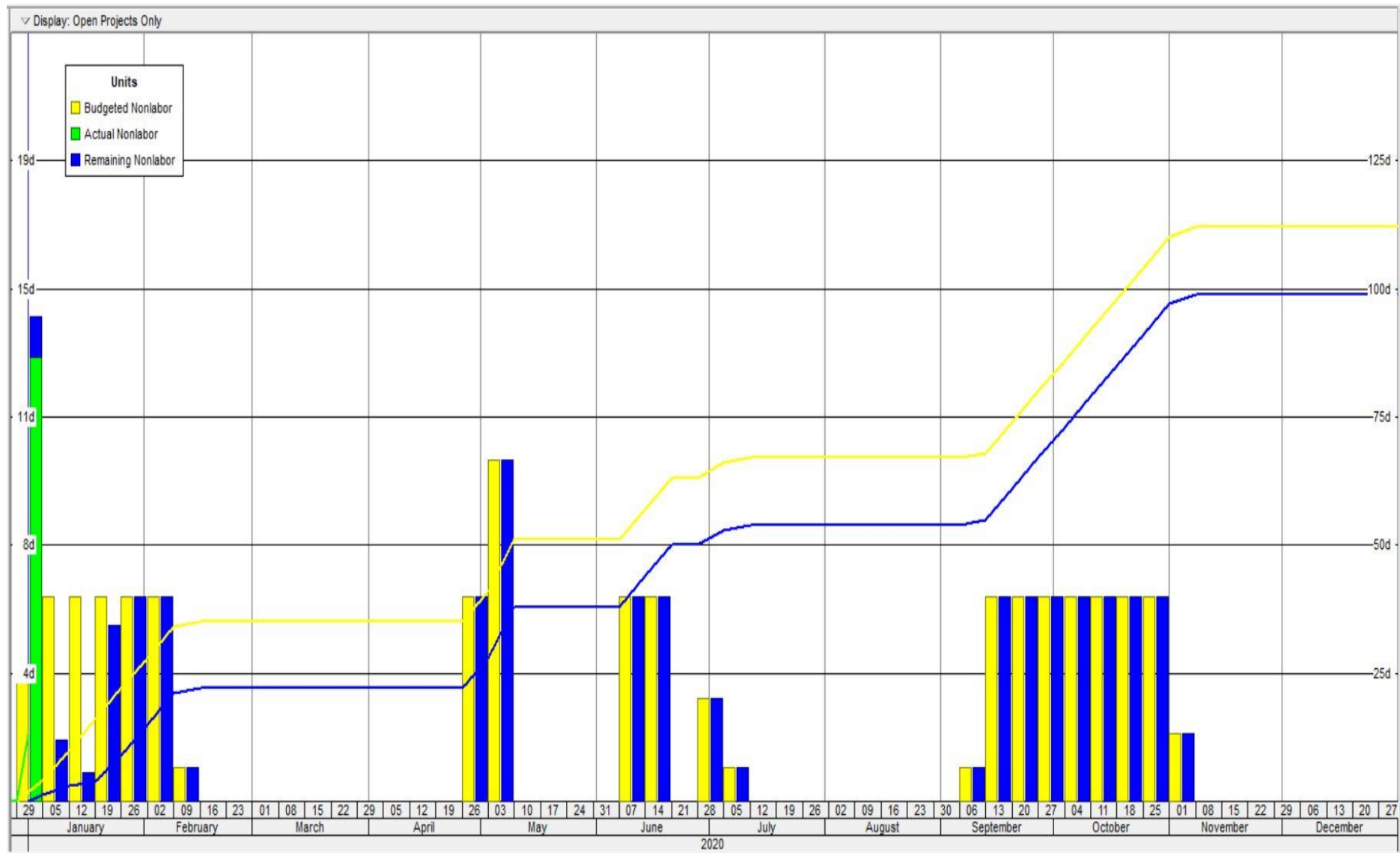
Histogram (Budgeted Total Cost) for Khewra Salt Mines Project on P-6:



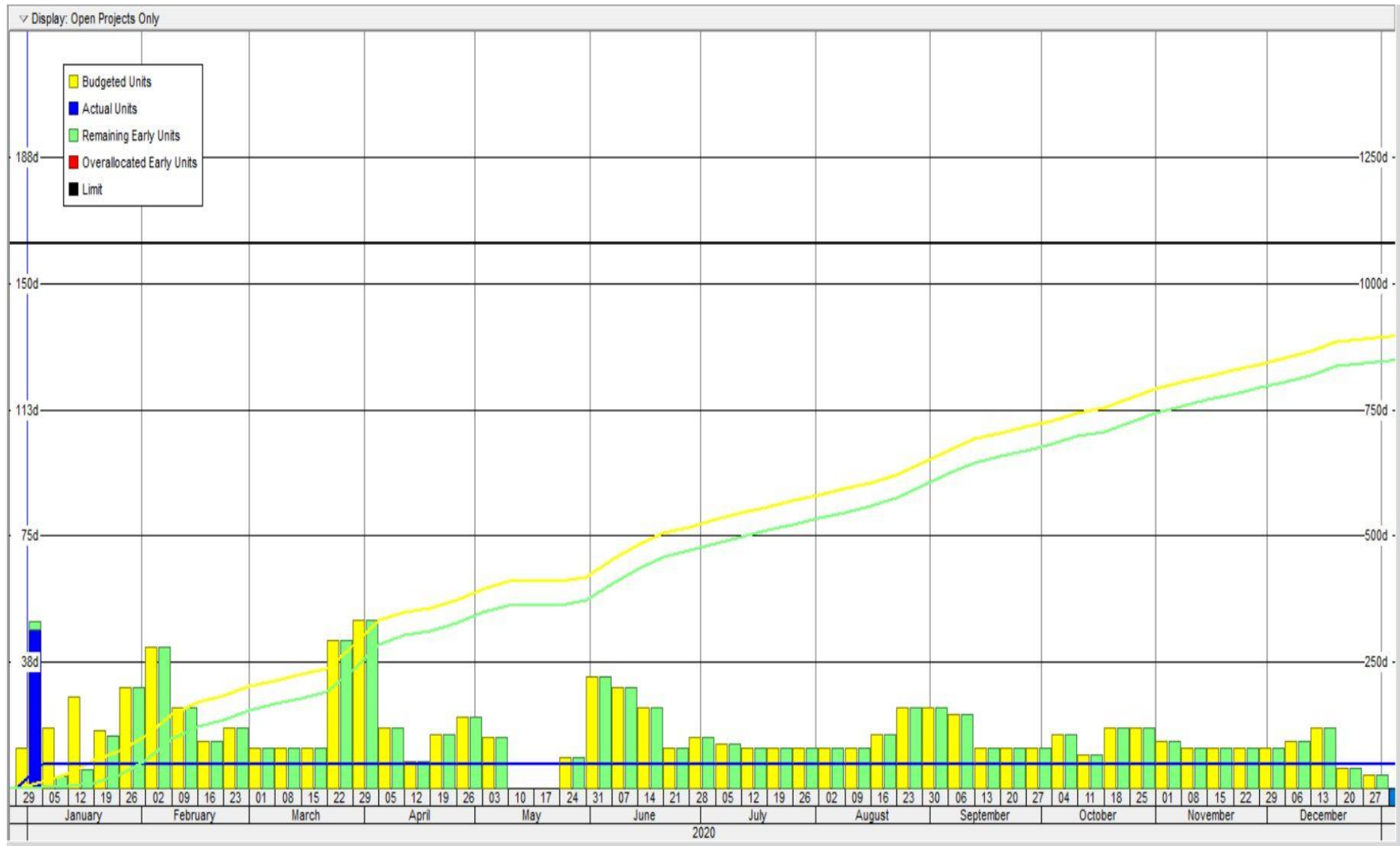
Histogram (Budgeted Units Labor) for Khewra Salt Mines Project on P-6:



Histogram (Budgeted Units Non Labor) for Khewra Salt Mines Project on P-6:



S-Curve Cumulative for Khewra Salt Mines Project on P-6:



References:

https://en.wikipedia.org/wiki/Khewra_Salt_Mine

<https://www.dawn.com/news/1507289>

<https://fp.brecorder.com/2019/06/20190610484349/>

<http://www.pmdc.gov.pk/>

Khewra Salt Mines Project

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