

# **PREFEASIBILITY REPORT**

**FOR**  
**Proposed Intermediate Chemical Unit**  
**(Chromic Acid, Basic Chromium Sulphate,**  
**& Saccharin)**  
**At**  
**Sirigitti Industrial Area, Bilaspur, Chattisgarh**

**Submitted to:**  
**MINISTRY OF ENVIRONMENT & FORESTS &**  
**CLIMATE CHANGE**

Submitted By:  
**BEC Fertilizers**  
**(Unit of Bhilai Engineering Corporation Limited)**  
Bilaspur

February - 2015

## 1. Executive Summary

Sr.No.	Item	Description
1	Promoter	BEC Fertilisers, Bilaspur (C.G) (A unit of Bhilai Engg. Corporn. Pvt Ltd)
2	Location	Sector 'A' Industrial Estate Sirgitti Bilaspur (C.G) - 495004  <b><u>Geographical Co-ordinates</u></b>  Latitude: 22°02'29.4" N Longitude : 89°09'32" E
3	Production capacity	6900 TPA
4	Products	<ul style="list-style-type: none"> <li>• Chromic acid - 2100 TPA</li> <li>• Basic Chromium Sulphate - 4500 TPA</li> <li>• Saccharin - 300 TPA</li> </ul>
5	Operating days/year	300 days
6	Operation	3 shift (batch process)
7	Land requirement	5300 sqm
8	Raw material and source	<ul style="list-style-type: none"> <li>• Sodium dichromate: Turkey, Hyderabad, Odisha, Russia, S.Africa</li> <li>• Sulphuric acid: In house</li> <li>• OTS : India, china</li> </ul>
9	Water requirement	80 KLD will be sourced from CSIDC
10	Power requirement	Source : CSEB 2 No. DG sets of capacity 1070 KVA each are already installed to meet the emergency power requirement.
11	Cost of the project	Rs. 8.5 crore

### 2.0 Introduction of the project/Background information

#### 2.1 Identification of project and project proponent.

This is a chemical manufacturing unit, where one of the raw material is chromium compounds and products are chromium chemicals and organic chemicals respectively.

#### 3.0 Brief description of nature of the project

The brief description of the production is given below:

a) Chromic acid: (Inorganic compounds)

Sodium Bichromate and Sulphuric acid are consumed as raw materials, and allow react in a batch reactor with application of heat. Chromic acid and Sodium bisulphate are produced by double decomposition reaction. Chromic acid is collected in a drum after cooling and bisulphates are dissolved in water and consumed in the BCS production. Production capacity of the plant is about 7.0 MT per day in 3 shifts.

b) Basic-chrome-sulphate: (Inorganic compounds)

Sodium Bichromates are reduced by sugar in presence of Sulphuric acid to form Basic-chrome-sulphate. Bisulphate solution available from chromic acid production and spent acid available from Saccharin productions are used in suitable ratio. Production capacity of the proposed unit in the batch process is about 15 MT per day with 3 shifts working.

c) Saccharin/Sod. Saccharin: (Organic compounds)

o-Toluene Sulphonamide is oxidized by Sodium Dichromate in presence of Sulphuric acid. The product was further maintained for ring closure reaction to form Saccharin. Saccharin is separated from the mixture by filtration. The spent acid is collected from filtration and is consumed in the BCS production. The crude Saccharin is collected and is purified to form Saccharin insoluble. It is again treated with Soda ash to form Sodium Saccharin crystal. Estimated production capacity per day in the batch process is 1 MT with 3 shifts working.

#### **4.0 Need for the project**

- 4.1 Chromic acid is used in surface protection coating on steel as hard chrome and light chrome electroplating. Both big workshop and small workshops are engaged in this work. About 70% in of total chromic acid produced are consumed in metal finishing industries, and 20% are consumed in paint/pigment industries;
- 4.2 Basic-chrome-sulphate is used in chrome tanning of leather (95%) and synthesis of other trivalent chromium compounds; and
- 4.3 Saccharin is used as non nutritive sweetener in oral care products. It has no calorific value as it is not absorbed by intestine, so is used as sugar alternative as sweetening agent. It is also used as sugar free sweetener in various food and health care formulations such as soft drinks, candy, biscuit and toothpaste.

#### **5.0 Demand-Supply Gap**

All the three products are imported to meet the indigenous demand.

#### **6.0 Imports vs. Indigenous production**

All the three products are imported in regular interval to meet the market demand.

## **7.0 Export possibility**

Chromic acid: Countries in the Middle East region has good demand of chromic acid. Beside this, countries like Bangladesh, Nepal, Saudi Arabia, Taiwan, S. Korea, Brazil, UK and Iran are regular importer of chromic acid.

Basic-chrome-sulphate can be exported to Turkey, Thailand, Iran, Japan, Bangladesh, Pakistan, and Korea beside home consumptions.

Sodium saccharin crystals can be exported to South American country and countries around India.

## **8.0 Domestic/export markets.**

These items have both domestic and export markets.

## **9.0 Employment Generation (Direct and Indirect) due to the project**

The total manpower required for the proposed project will be about 100 people.

## **10.0 Project Description**

### **10.1 Type of project**

This is a chemical manufacturing unit, where one of the raw material is chromium compounds and products are chromium chemicals and organic chemicals respectively.

In chromic acid, sulphuric acid are used which is produced in the plant. Bisulphate produced as byproduct in the reaction also contains some excess acid and un-reacted sodium bichromate. These are dissolved in water and consumed in BCS production.

In saccharin production, added acid are recovered as spent acid along with entire amount of sodium bichromate, which is reduced to trivalent form. This spent acid containing trivalent chromium are collected and directly used in BCS production.

### **10.2 Project Location**

The project will be located within the existing plant premises located at Sirigitti industrial area, Bilaspur, Chattisgarh. The index map is shown in **Figure-1**.

### **10.3 Details of alternate sites considered and the basis of selecting the proposed site, particularly the environmental considerations gone into should be highlighted.**

No alternative site has been selected as the proposed unit will be developed within the existing plant premises.

### **10.4 Size or magnitude of operation**

The production capacity of the proposed unit is about 6900 TPA. The details are given below:

For Chromic acid raw materials required per day is:

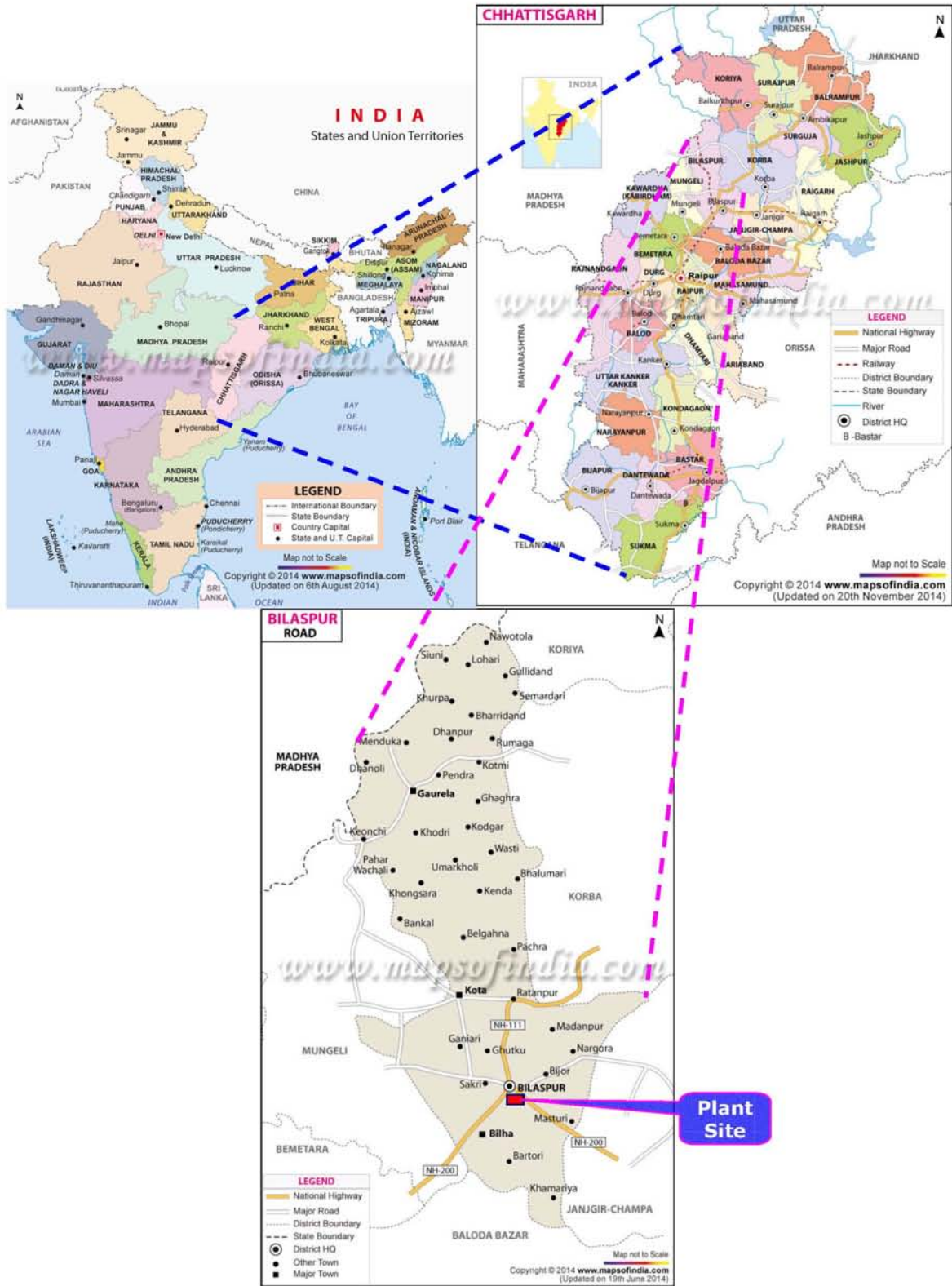
- i) Sodium dichromate- 10 MT
- ii) Sulphuric acid-14.0 MT

For BCS, raw materials requirement per day is:

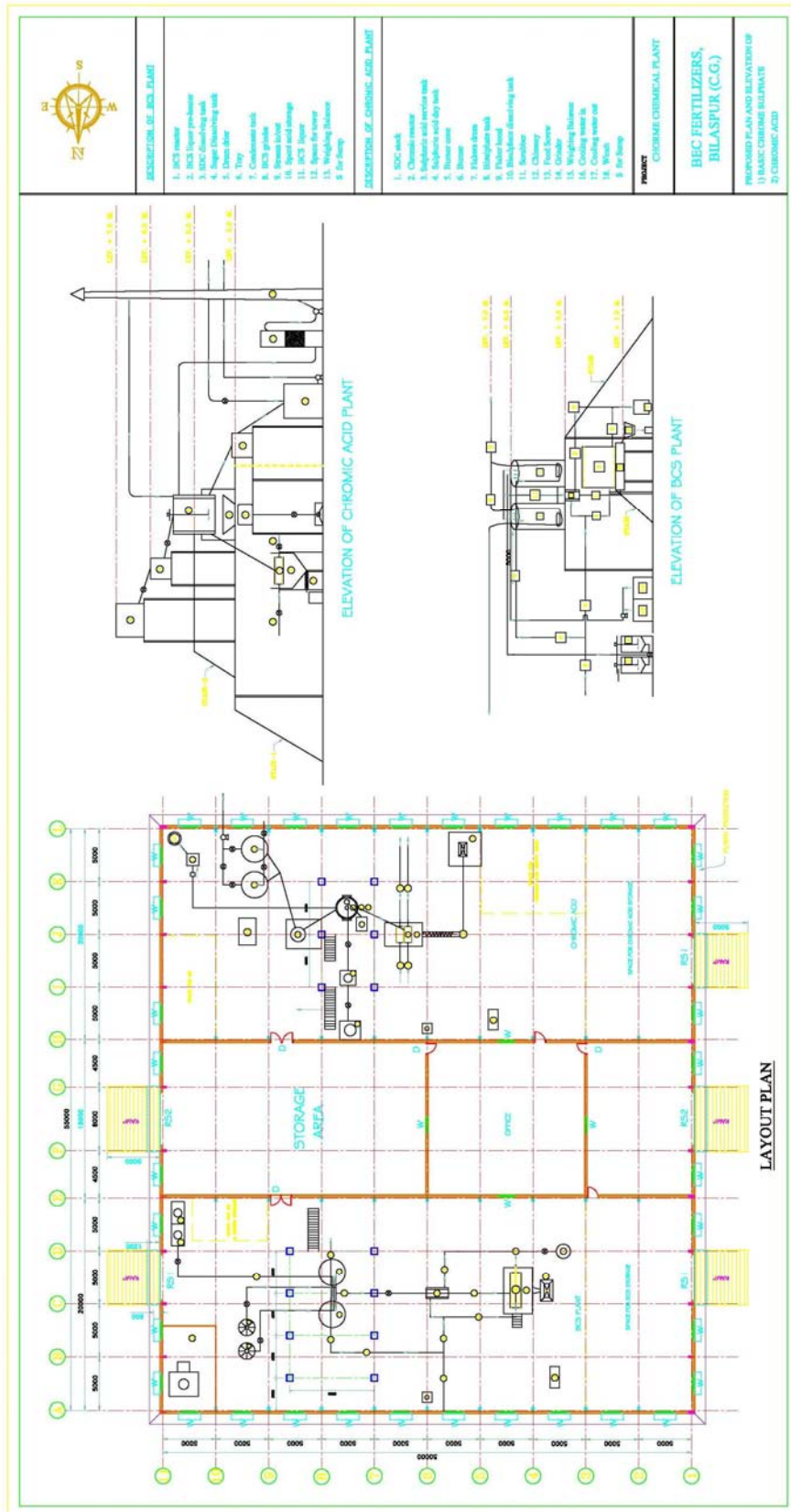
- i) Sodium dichromate-4.5 MT
- ii) Spent acid- 22.5 MT
- iii) Sugar-1.2 MT

For Saccharin, raw materials requirement per day is:

- i) O-Toluene sulphonamide-1.0 MT
- ii) Sodium dichromate-2.0 MT
- iii) Sulphuric acid-6.5 MT
- iv) Soda Ash-0.80 MT



**FIGURE-1**  
**INDEX MAP**

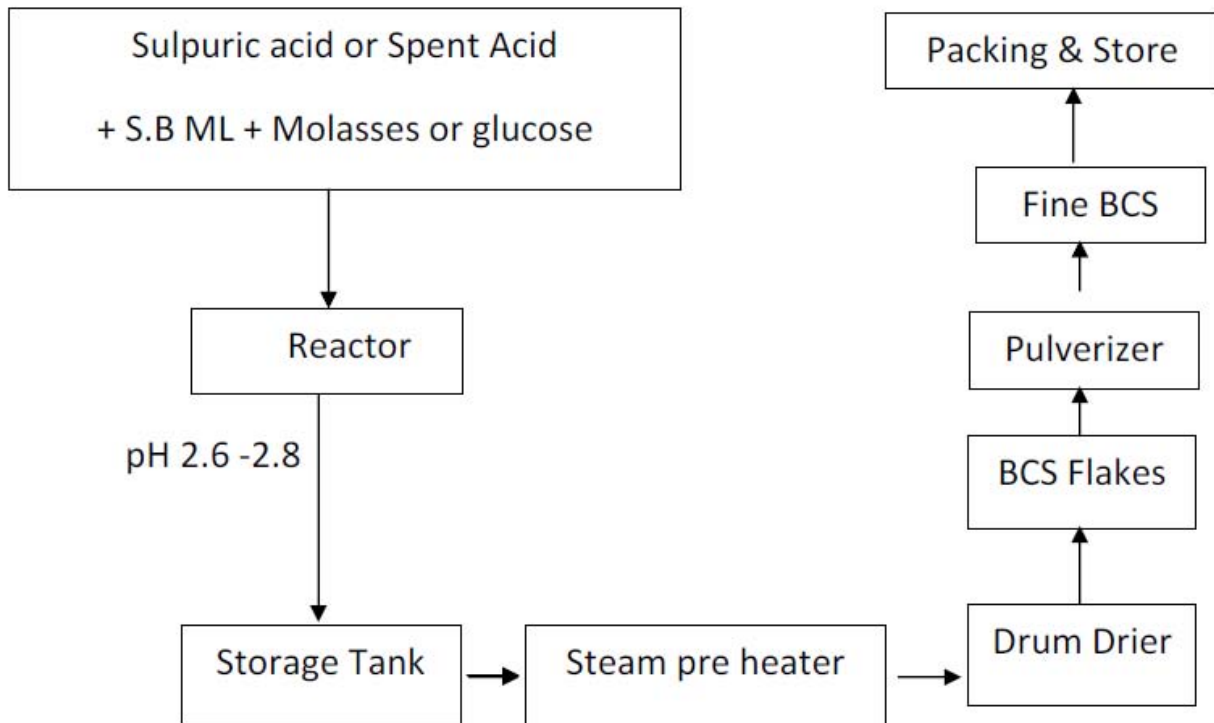


**FIGURE-2  
PLANT LAYOUT**

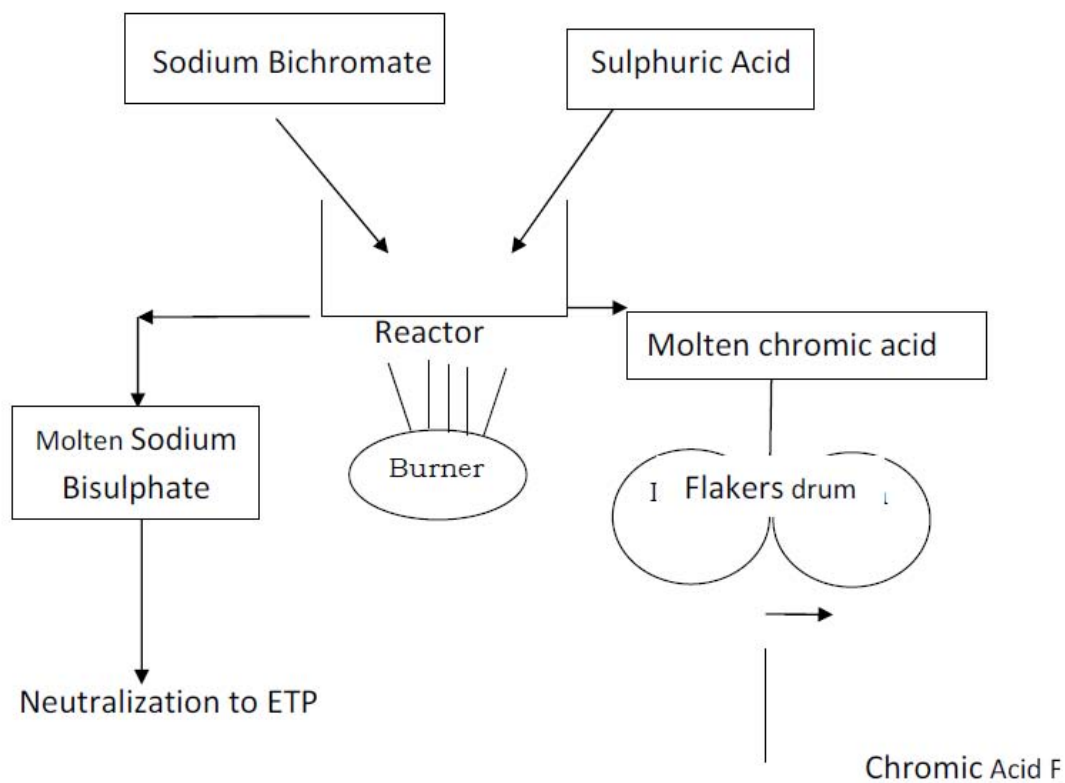
### 11.0 Project description with process details

Intermediate chemical substances typically consist of chemical compounds, which are manufactured through intermediate steps and reactions under precise conditions. The intermediates manufacturing usually comprises four to seven steps of process of mainly chemical synthesis. Manufacturing plants for such products are designed and built in such a manner that these steps can be fully or partly accommodated in the same plant for various types of products. For our proposed expansion, similar flexibilities would be considered for production of one or more products with no of steps of manufacturing process.

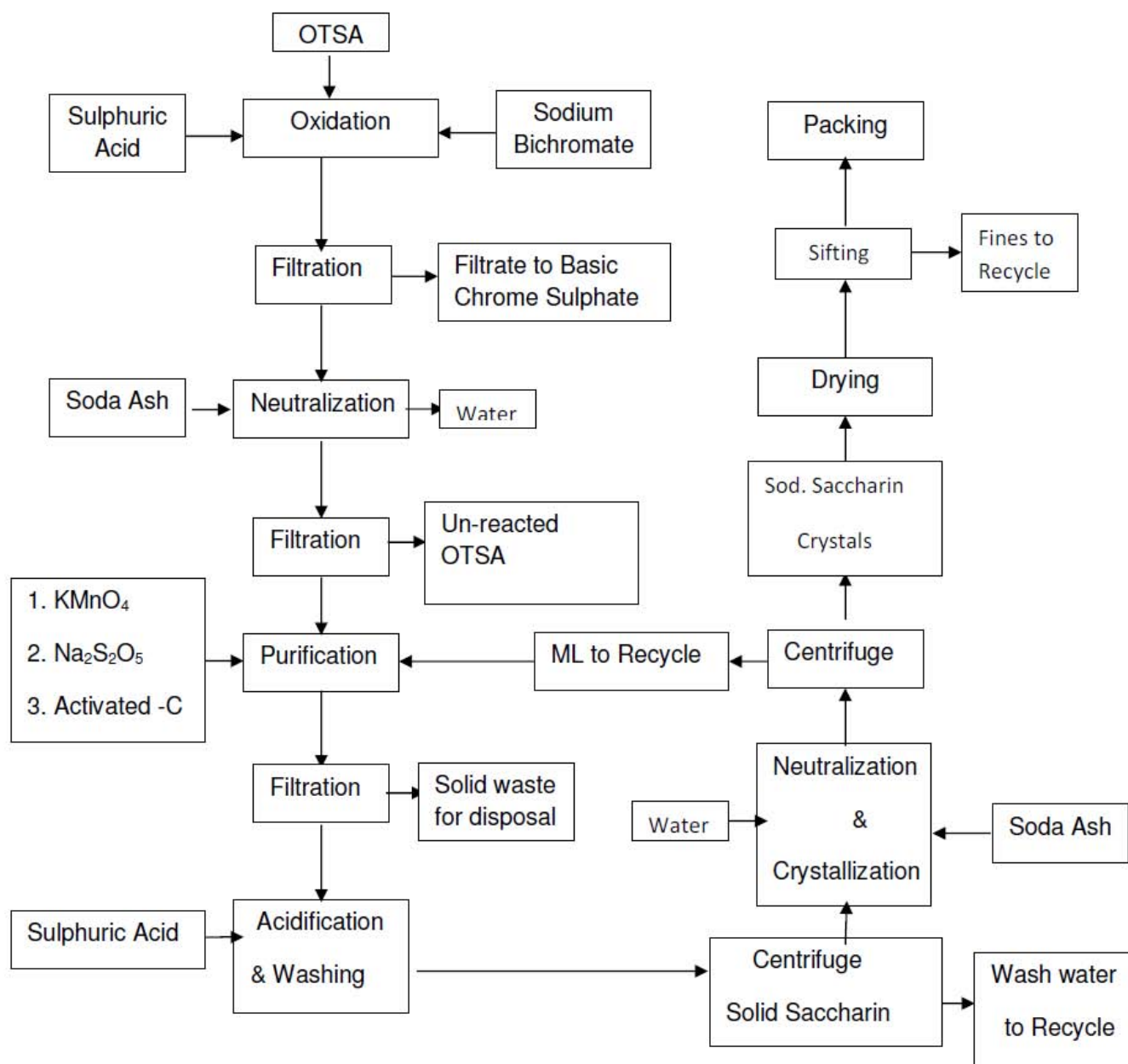
#### Basic Chromium Sulphate



### Chromic Acid Plant



## Sachharine



**12.0 Raw materials**

## 1. Chromic Acid

Sr.No	Raw material	Quantity (MT)
1	Sodium Bichromate (anhydrous)	3000
2	Sulphuric acid	2250
3	Molasses	360

## 2. Basic Chromium Sulphate (BCS)

Sr.No	Raw material	Quantity (MT)
1	Sodium Bichromate	2000
2	Sulphuric acid	2100
3	Molasses	360

## 3. Saccharin

Sr.No	Raw material	Quantity (MT)
1	OTS	300
2	SB	600
3	S.Acid	1600
4	Soda Ash (light)	180
5	Pot.Permanganate	0.2
6	SMBS	1.0
7	Charcoal	1.5

**13.0 Resource optimization/ recycling and reuse**

No reuse/ recycle required in chromic acid and BCS production, but in saccharin production recycle of OTS and spent acid are required. The procedure is as follows:

Recycle of spent acid in saccharin production: Spent is added in a controlled way to concentrated sulphuric acid so that, the acid sp.gr to bring down from 1.82 to 1.73. Recycle of un-reacted OTS: Reactor containing saccharin and un-reacted OTS was treated with enough soda ash to dissolved saccharin and the insoluble OTS are subsequently separated by filtration. The OTS are collected and added in the next batch for saccharin production.

**14.0 Water Requirement**

The water requirement for the proposed project is about 79 KLD which will be met from CSIDC water supply system.

## 15.0 Quantity of wastes to be generated (liquid and solid) and scheme for their Management/disposal

No solid and liquid waste are generated in the manufacture of above three items.

## 16.0 Hazards and preventive measures

A) Chromic acid is a highly reactive and oxidizing in nature and hazardous chemicals so care should be taken at the time of handling and spill responses follows:

- Care to be taken to avoid leakage of chromic acid;
- Wear respirator (nose mask) and protective clothing when cleaning spill;
- Do not get spill material on skin and clothing;
- Remove ignition source from area where inflammable vapor may exist; and
- Carefully sweep up spilled material and place it in a suitable container for disposal.

B) BCS:

- BCS has harmful effect on skin and eye;
- After contact with skin and eye wash immediately wash with enough water; and
- Avoid breathing with BCS dust.

C) Saccharin

- Prior to 2000 the Food and Drug Administration required that a warning label to be placed on product containing saccharin sodium due to its possible health risk. But in 2010, the EPA has removed it from the list of hazardous materials. However, ingesting saccharin sodium may still cause some side effects.

## 17.0 Site Analysis

### 17.1 Connectivity

The proposed project site is well connected with roadways and railway network. NH-200 is located at a distance of 500 km. Nearest railway station is located at bilaspur at a distance of 500 km and Chakarbhata airport is the nearest airport at a distance of 7 km from the proposed project site.

### 17.2 Land Form, Land use and Land ownership

The project site, which is located in the Sirgitti industrial area is within the existing plant premise so the project site is devoid of agricultural land but within the study area both agricultural and scrub lands are present. The land use land cover map for the study area was prepared by processing the standard False Color Composite (FCC) of IRS P6 LISS III satellite imagery with 23.5 m resolution. The land use land cover map is shown in **Figure-3**. The land use classification is tabulated in **Table-1**. About 59.2% of the study area is covered by agricultural land, which is characterized by scattered plantation of 12.79 % and built up area of 12.64 %. Next to built up area about 11.12% is fallow land and 2.9 % water body. 0.62 % of the area

constitutes shrub land; 0.53 % constitutes dry river bed and 0.03 % of the study area constitutes marshy land.

**TABLE-1**  
**CLASSIFICATION OF LAND USE AND LAND COVER**

<b>Class Name</b>	<b>Area Sq. Km</b>	<b>Percentage</b>
Fallow land	39.9	11.1
Marshy Land	0.1	0.0
shrub	2.2	0.6
Agricultural land	212.8	59.3
Plantation	45.9	12.8
Dry river bed	1.9	0.5
Build up Area	45.4	12.6
Water Body	10.6	2.9
Total	358.9	100.0

### 17.3 Topography

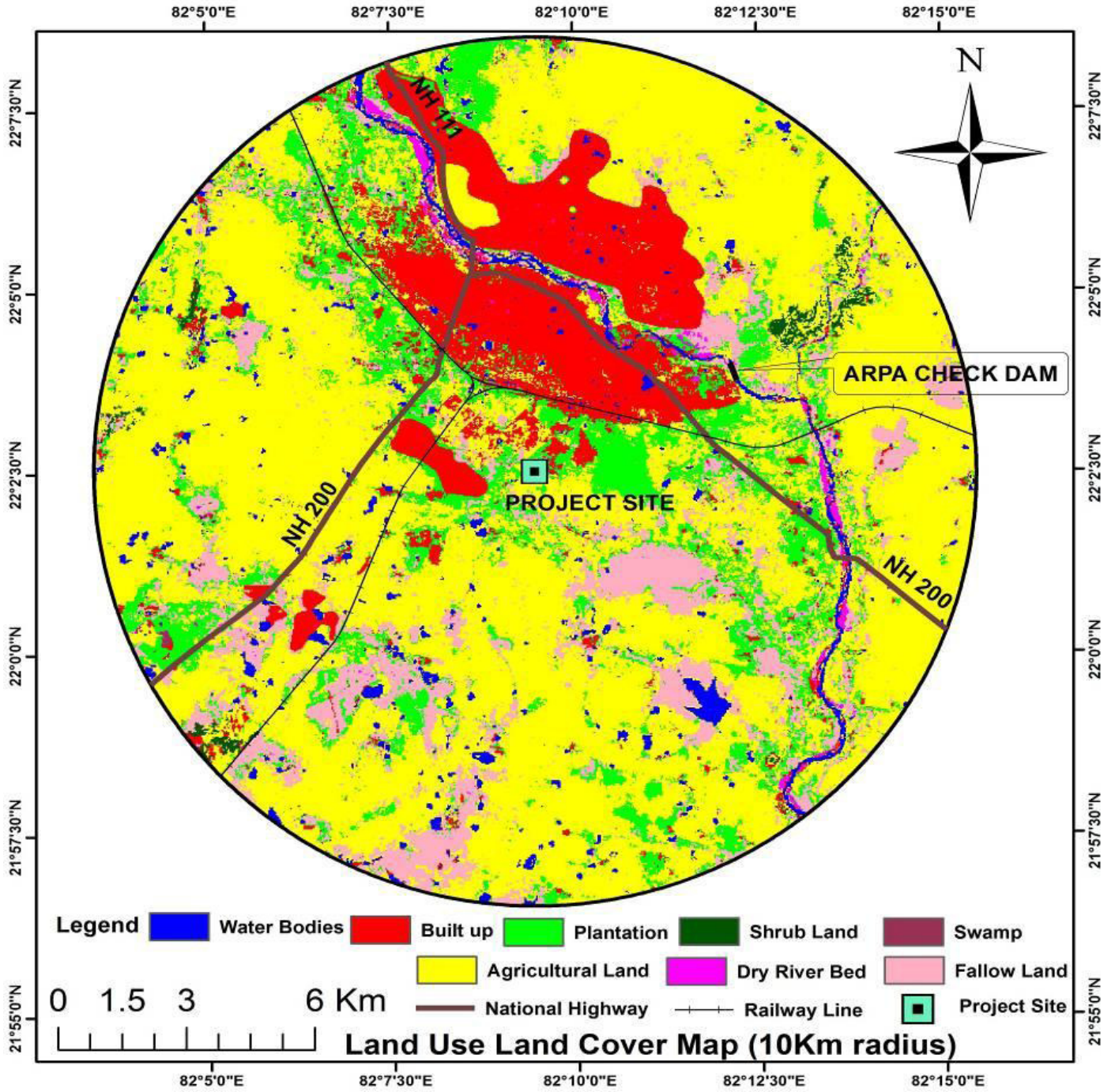
Bilaspur plain is bisected by the river Arpa and its tributaries which divides this plain into two parts western and eastern. The elevation of the plain is below 300 meter above the sea level. Bilaspur city area where site is located occupies gently sloping terrain, gradually sloping towards the Arpa River from north and south. The area south of Arpa River gently slopes and forms a shape like saucer at the city's centre. The hillocks north of the city are responsible in creating drainage channels. There are five major drain basins of the Bilaspur are namely Chantidih, Chingrajpara, South Eastern Coalfields Ltd. Jawali, Torba. The combination of natural and constructed drains forms a rectangular drainage pattern ultimately discharging in to the Arpa River. The drains unable to join the river end up in local depressions creating ponds.

### 18.0 Existing land use pattern

No change in land use as the proposed project will be established within the existing plant premises located at CSIDC, Sirgitti industrial area. No national parks, wildlife sanctuary, eco sensitive area within the 10 km radius.

### 19.0 Existing Infrastructure

Infrastructural facilities of the existing plant will be adequate for the proposed unit also.



**FIGURE-3**  
**LAND USE LAND COVER (10 KM RADIUS)**

## 20.0 Soil classification

The type of soil in the region is black cotton soil. The soil samples were analyzed for various parameters and the results are given in **Table-2**.

**TABLE-2**  
**SOIL CHARACTERISTICS**

S.No.	Parameter	Unit	SS-1	SS-2	SS-3	SS-4	SS-5
1	pH	--	7.1	7.12	7.1	7.2	7.2
2	Bulk Density	g/Cc	1.44	1.47	1.31	1.45	1.43
3	Soil Texture	-	Clayey loam	Clayey loam	Clayey loam	Clayey loam	Clayey
4	Colour	--	Dark Gray	Dark Gray	Dark Gray	Black	Black
5	Available Nitrogen	Kg/Ha	230	225	221	235	241
6	Available Phosphates	Kg/Ha	40.1	41.3	40.8	39.6	38.5
7	Available Potassium	Kg/Ha	138	140	137	141	139
8	Organic Carbon	%	1.3	1.32	1.31	1.33	1.3
9	Organic Matter	%	2.26	2.29	2.27	2.31	2.26
10	Arsenic	mg/kg	BDL	BDL	BDL	BDL	BDL
11	Chromium	mg/kg	BDL	BDL	BDL	BDL	BDL
12	Cadmium	mg/kg	BDL	BDL	BDL	BDL	BDL
13	Mercury	mg/kg	BDL	BDL	BDL	BDL	BDL

## 21.0 Proposed Infrastructure

- I) Industrial area : The project site is located within CSIDC. Hence no change in land use.
- II) Education The number of educational institutions i.e. schools and colleges in the year 2006-2007 (City Development Plan, Bilaspur District, 2011) are given in **Table-3**.

**TABLE-3**  
**EDUCATIONAL INSTITUTIONS IN BILASPUR DISTRICT**

Sr. No.	Category	Total No.
1	Primary schools	1222
2	Upper primary (middle) school	502
3	High school	60
4	Higher secondary school	57
5	Degree colleges	5
6	Professional and PG colleges	5
7	Ashram schools	6

*(Source: City Development Plan, Bilaspur District, 2011)*

## Medical Facilities

Bilaspur district had 128 number of hospital and primary health centers in the year 2006-2007. The number of bed was about 268 (City Development Plan, Blaspur District, 2011).

### III) Employment and Communication

The company will employ about 100 workers on regular basis. Out of these one or two will be at Managerial level. The remaining positions can be classified as skilled, semi skilled and non skilled.

**Transport** The nearest road to the project site is the major district road no. 8, which is approximately 1.5 km away (NW direction) from the project site. NH 200 is about 4.5 km away (East) from the project site.

**Postal and Communication Services** The postal and communication services are well developed in the region

### IV) Green Belt

The greenbelt area developed in the existing plant is aourng 18.35 acres. The details inside the plant area is given in **Table-4** .

**TABLE-4**  
**GREEN BELT DETAILS**

Sr. No.	Location Area	Name of Plants
1	Near ADM, road slop and canteen side	Neem
2	Plant area	Sisu
3	North and east side of factory	Karanj
4	Forest area in south side	Akesia
5	Plantation at west side near boundary wall	Eucalyptus
6	Road slope and Forest area near Muck yard	Jamun
7	Road slope and near boundary wall north side	Behara
8	Road slope and south side near final point	Paras Pipal
9	Opposite Canteen and Road side	Satwan
10	ADM front garden and road side	Battal Pom
11	Near VIP garden road side & near time office	Ashoka
12	Road side area at centre avenue	Babul
13	Near ADM barrack area	Teak

### V) Sewerage System

The sewage will be treated in the oxidation pond to stabilize the decomposable matter. The velocity of the effluent through the pond will be very low which will lead to the settlement of the suspended materials. After stabilization in the primary pond which is divided into the two zones, the effluent overflows to the secondary pond and from there it gets discharged into the drains.

The overflow of the primary pond is harmless so the levels should be regularly monitored. When the primary pond is filled with sludge, the flow should be stopped and left for drying. When it gets dry, the residue can be removed and be utilized as the fertilizers.

#### **VI) Solid Waste Management**

Sludge from STP will be used for manures after treatment or stored in lagoons. The sulphur sludge generated from the sulphuric acid plant will mostly be used as filler in the SSP Plant since sulphur is secondary nutrient to alleviate the nutrient the sulphur deficiency in Indian soils. Silica generated in scrubbing of fluorine during the formation of hydro fluorosilicic acid will be used as filler and also will be used as additive in SSP. Empty, drums, containers etc. will be washed thoroughly with suitable solvent before selling them to Government authorized recyclers. The wash water will be give treatment to meet the regulatory requirements before discharging into water body.

#### **VIII. Power Requirement & Supply/Source**

The power requirement for the proposed unit will be about 0.7 MW which will be sourced from CSEB. To support the safe operations during power failure, 2 no of D.G set (1070 KVA) is proposed to meet the emergency power demand for proposed expansion.

#### **22.0 Rehabilitation and Resettlement (R & R) Plan**

No R & R issues involved as the project is located within the premises of existing plant which is located in CSIDC.

#### **23.0 Project Schedule & Cost Estimates**

The project implementation time will be 24 months after getting all the statutory clearances. The estimated cost of the proposed project is about Rs. 8.5 crore.