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INITIAL SURVEY OF IRON SAND, AT THE MALANG, PEJAGRAN & KEBURUHAN VILLAGES, NGOMBOL SUBDISTRICT, PURWOREJO REGENCY, CENTRAL JAVA PROVINCE

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ABSTRACT

Initial Survey of iron sand Including geological mapping and shallow drilling (which only 10 meter penetration), this activity is a pilot project of PT. Karya Buana Abadi as the fander and trusted to geological engineering department survey team of Padjadjaran University Bandung and used Q Muria Swasindo flag as permission letter keeper from Purworejo Regency.
Iron sand resources which fand in research area was rich, start from the surface of the soik to the bottom of shallow drilling, from its 50 Ha area there are 14 million ton deposit of iron sandwhich in the future wilk sold to Korea for industrial need.
***Keywords**: iron sand, deposit*

ABSTRAK

Survey bahan galian pasir besi meliputi pemetaan geologi dan pemboran dangkal (hanya sampai 10 meter penetrasi), dan kegiatan ini oleh pihak PT. Karya Buana Abadi sebagai pemrakarsa dipercayakan kepada Tim Survey Fakultas Teknik Geologi Universitas Padjadjaran Bandung dengan memakai bendera Q Muria Swasindo sebagai pemegang izin dari Kabupaten Purworejo.
Sumberdaya pasir besi yang terdapat di daerah penelitian sangat berlimpah mulai dari permukaan tanah sampai ke dasar pemboran masih dijumpai deposit ini, dari luas areal 50 Hektar terdapat 14 juta Ton deposit pasir besi yang kelak akan dijual kepada pihak Korea untuk keperluan industri.
Kata kunci: pasir besi**,** endapan

INTRODUCTION

Survey team have an opportunity to execute the Initial Survey of iron sand deposit in the region of Purworejo Regency. Iron sand in this area genetically is the coastal alluvium in the surface deposit from Holocene age contain of loose material of sand from well sorted to medium sorted.

Purpose of this Initial Survey is to ensure the existence of iron sand deposit and its distribution both lateral and vertical, and the goal is to gain 50Ha long view of the iron sand mining area that located less than 200 meters from off the coast of the Indian Ocean with another areas that indicates the existence of iron sand deposit in the region of villages included in Ngombol sub district of Purworejo regency.

Research areas are located in Malang village, Pejagran village, and Keburuhan village at Ngombol Sub district of Purworejo Regency Middle Java Province. Research areas could reached from Jakarta with a flight to Yogyakarta for about 1 hour and continued with four wheel drive for about 2 hours in a swift road, or using four wheel drive for about 7 hours from Bandung straight to the research location.

1. Regional Geologic

Iron sand in this area genetically is the coastal alluvium in the surface deposit from Holocene age contain of loose material of sand from well sorted to medium sorted.

2. Basic Theory

A. Hematite (Fe2O3)

The existence of hematite commonly in layered form, and the forming processes still a controversial for a geologist, is it formed by metamorphic processes or by sedimentation processes.

Depositional type of hematite can be classified:

1. BHJ (Basic Hematite Jas-per). It was layers between hematite and jasper show-ed by intervals of black layer from hematite and red layer from jasper.
2. BHQ (Basic Hematite Quartzite). It was layers between hematite and quartz showed by intervals of dark red-black layer from hematite and white layer from quartz.

Distributions of hematite type are usually wide, because it was a continued layer. Hematite characteristics are:

- Mineral and the most abundant ore of iron
- Composed of ferric oxide, Fe2O3
- Contains 69,9 % Fe
- Hematite occurs in rhombohedral crystal, called specular Iron in massive formations, and in earthy forms, called red ocher.
- The crystals are trans-lucent, range in color from dark gray to black, and have a brilliant metallic luster; the earthy varieties are lusterless and red.
- The hardness ranges from 5.5 to 6.5 and the specific gravity from 4.2 to 5.25.
- Hematite is a constituent of a number of abrasives and pigment.

B. Magnetite (Fe3O4)

Forming processes commonly because of its association with an igneous rock both by intrusion or lava flow, so the distribution wasn't really wide (Local area). It was usually with massif structure and dark color. We have to mention about phosphor contain in iron ore, this would affect the quality of iron ore in its use. A good iron ore is the one which contain phosphor less than 0.05%. This concentration will affect the quality of the steel as a product. The more iron ore contain phosphor, the more brittle the steel. In determination the iron ore concentration we use labora-tory analysis of chemistry. Magnetite characteristics are:

- Composition Fe3O4
- Contains 72.4 % Fe
- It occurs as a strong natural magnet known as lodstone and crystallizes in the isometric system.
- Usually in granular masses but frequently in octahedral crystals.
- Iron black and opaque, with a metallic luster.
- It has a hardness of 5.5 to 6.5 and a specific gravity of 5.18. From explanation above we can see that iron ore which come from Precambrian and Silurian won't contain phosphor, because there was no living creature produce phosphor. Whereas the devonian iron ore to recent, it contain phosphor from bones of living creature.

Iron Sand Deposit

Sand deposits which contain mostly by minerals of iron ore, like Magnetite (Fe3O4), commonly found with another heavy mineral like Zircon, Rutile, Hematite, and also mafic mineral (Pyroxene, Horn-blende).

METHOD OF INVESTIGATION

The Equipments

Tools and material used in our research, i.e.:

1. Regional Geologic Map of Kebu-men, Java, by S. Asikin, A. Han-doyo, H. Busono dan S. Gafoer, (1992)
2. Indonesian Digital Geomorpholo-gy Map Sheet 1408-124 Ngombol Scale 1:25000 by Bakosurtanal, Jakarta, (1998)
3. Brunton Geologic Compass
4. Suunto type compass
5. Geologic hammer
6. Loupe
7. Power rig type of drill machine with Honda engine 5,5 Pk

8. Water machine for water flushing Sanchin type 60
9. Water machine for water sully Sanchin type 45
10. Pick up for field activity transportation
11. Global Positioning System (GPS) type GPS map 60 Garmin
12. Laptop
13. 5m and 200m roll meters
14. Tarpaulin/Canvas size 4x6, and 6x8
15. Hand specimen pouch
16. Shovel or crowbar
17. Machete
18. Permanent felt-tip marker
19. Writing tools
20. Etc

Geologic Mapping and Shallow Drilling Methods

Geological mapping done to determine the distribution of iron sand outcrop laterally and every outcrop descript especially thickness of the iron sand and then we get the hand specimen to be taken to laboratory to be analyzed with channeling (chemical analysis). Shallow drilling used drill machine power rig type with 5,5 Pk (HP) and 4m length tripod, drilling processes only reach 10m deep using water flushing and wind blasting every 2m deep so the iron sand in that level come out to the surface and homogeny blended and take the hand specimen in every 2m deep for about 2kg in 2 sack for every exemplar, one for chemical analysis in laboratory and another one for draft of the company so if someday they have doubt for the first chemical analysis they could compare it with the former result of laboratory analysis.

RESULT AND ANALYSIS

Geological Mapping

Geological mapping execute in three locations, *corn field* in Malang village for about 50ha wide and block of Keburuhan village for about 5ha wide. Research focused in iron sand outcrop that measurable in thickness and could be taken for a sample with channeling for chemical analysis in laboratory to determine iron (Fe) concentration.

Iron sand around research area distributed equally in every location and found no present of soil or humus, in macroscopic view iron sand seems colored black, from fine sand to medium sand with angular to sub angular shape and well sorted to medium sorted.

Coastal geomorphology with terrace alluvium about 30m height and they lay along west to east shore. Part of its land has become crops, and another part becomes dry season crops like corn field, red pepper, watermelon, and squash.

Shallow Drilling

Shallow drilling for about 10m deep execute in Mangan village block on 8 spot, 1 spot in the corn field, and another 1 spot in Keburuhan village. We take the hand specimen in every 2m deep for chemical analysis in laboratory to determine iron (Fe) concentration. Shallow drilling used drill machine power rig type with 5,5 Pk, Sanchin 45 and centrifugal pump for water supply.

We used water flushing to pump out iron sand to surface, and there is no use of drill point/bit, so we just use drill bar/rod in every deep measurement then we did the wind blasting of flushing water, and for shield the upper drill hole wall we did casing drill 89mm so there will not any blending with another sand material above.

Profil Area 1 = 12,882 M²
Profil Area 2 = 6,686 M²
Profil Area 3 = 6,928 M²
Specific gravity of iron sand = 1.85

Deposit 1 between Profil 1 and Profil 2

$$\frac{12.882 + 6.686\ M^2}{2} \times 280\ M \times 1.85 = 5{,}068{,}112\ Ton$$

Deposit 2 between Profil 2 and Profil 3
$\frac{6.686 + 6.928\ M^2}{2}$ x 420 M x 1.85 = 5,289,039 Ton

Total deposit at Malang = 10,357,151 Ton for area 35 Ha
For area 50 Ha = (50/35) x 10,357,151 Ton = 14,795,930 Ton

Quality Analysis

Iron sand quality determine by iron concentration which contained in sand, and titanium concentration as minor content, and also magnetite and hematite in major amount.

A. Chemycal Analysis

Chemycal analysis execute in CCIC laboratory Jakarta, which are tristed and guaranted for iron trading company and iron sand mining company from China and Korea.

From 10 drill hole @ 10 meters which execute in research area there are variated concentration of iron from chemical analysis in range 4.68 to 24.43 which both found on KBA 10 0-2 meters, and KBA 10 2-4 meters Block of Keburuhan village Ngombol Subdistrict of Purworejo regency, and another variation with 11 % concentration to 19 % (see appendix PT. CCIC Report of Analysis, Jakarta)

B. Petrography Analysis

Petrography aqnalysis result execute in TEKMIRA (Mineral and Coal Technology Development and Research Center) wich samples are taken from 4 drill hole, i.e. KBA 1, KBA 4, KBA 9, and KBA 10swhowns existence of magnetite minerals variation from 29.04 % to 40.973 % (see appendix TEKMIRA report analysis). Because the deposit of iron concentration and amount of magnetite very variated. So, in this location found some chanells when the deposit of coastal alluvium formed. So, when there is a chanell there must be contain iron and magnetite in large amount and when there is no chanell there must be contain just a little mount of iron and magnetite. As for potention of coastal alluvium deposit widely apread along Purworejo regency.

C. Mining Development Analysis

Corelation of Development and Environment

Activity planning can not be separated from National Development planning hierarchy wich determined in statute number 25/2004. Statute number 25, 2004 year, Development Planning grouped into 3 phase :

- Long Term Phase (25 years)
- Medium Term Phase (5 years)
- Short Term Phase (1 years)

As for result of Landscape Planning grouped into 3 main part, i.e. :

- National Territory Landscape Planning (NTLSP)
- Province Territory Lanscape Planning (PTLSP)
- Regency Territory Landscape Planning (RTLSP)

The third planning (RTLSP) has to be supported with detailed research so continued development issue will provide. Human desire for a better life have to be expressed in development plans. That plans including housing. Trade and Industry, mining, agriculture, transportation and many others.

CONCLUSION AND RECOMMENDATION

Conclusion

1. Morphology in research area is coastal alluvium that have been uplifted, so the alluvium had been formed into tereace and reached up to 30 meters elevation.
2. For about 50 Hectare mining area, there are deposit of iron sand of about **14,795,930 Ton** amout**.**
3. Iron sand qualityfrom chemical analysis shown maximum iron concentration to 24.43 % and

petrogrqaphy analysis contaqin magnetite to 40.973 %.

4. Iron sand mining in research area can be executed with open mining method and so from statute of mining venture because there are no living object and civilian plantation .

Recomendation

1. We have to made reserve account of detailed topography, because the alluvium had been formed into coastal terrace, so the area avent flat anymore.
2. Use drill system of 25 meters or 50 meters grid, to determine iron sand reserve with cut of grid system.
3. Land acquittal of local civilian can be negociate, because the local community hope they can resolved and rise economical matter with this iron sand mining.

REFERENCE

Anonimous, 2007, *Penentuan Zona Layak Tambang Galian Golongan C Sugai Puna dan Sungai Poso Kabupten Poso Provinsi Sulawesi Tengah*, Laporan Akhir, Pemerintah Kabupaten Poso, Dinas Pertambangan dan Energi, Tim Geololgi Fakultas Teknik Universitas Hasanuddin.

Geni Dipatunggoro, 2002, *Zonasi Potensi Bahan Galian Golongan C Yang Dapat Dikembangkan Di Kabupaten Lebak Propinsi Banten Berdasarkan Pertimbangan Geologi Fisik*, Tesis Magister, Bidang Khusus Pengelolaan Sumberdaya Bumi, Program Studi Rekayasa Pertambangan, Program Pasca Sarjana, Institut Teknologi Bandung.

S. Asikin, A. Handoyo, H. Busono dan S. Gafoer, 1992, *Peta Geologi Regional Lembar Kebumen, Jawa*, Direktorat Geologi dan Sumberdaya Mineral, Departemen Pertambangan Republik Indonesia, Bandung.

Tabel 1. Limitation or limiting criteria in analysis development of mining business.

Factor of Limitation	Criteria	Remarks
Reservation Area ❖ Area wich reserve to bellow that area ➢ Resapan Air ➢ Lereng ➢ Ketinggian	 ➢ 100 m distance ➢ 40% slope ➢ 1000 mdpl elevation	❖ Refer to Law No. 24 year 1992 ❖ Refers to Presidential Decree 32 of 1999 Referring ❖ To the Regulation on RUTRD / RTRW ❖ Material Development Goals quarrying C in a protected area must have an agreement.
❖ Local Anspices Area ➢ Coastal parallel ➢ River parallel ➢ Spring area	 ➢ 50 – 100m distance ➢ 200 m distance ➢ 100 m distance	
❖ Natural and Cultural Reservation Area ➢ Nature Reservation ➢ Wood ➢ Mangrove ➢ Forest ➢ Cultural and Science	 ➢ Out of those area	
❖ Special Reservation Area ➢ Magisterate ➢ Defence and Safety Department	 ➢ Out of those area	
❖ Critical area of hazard ➢ Erossion ➢ Floodplain	 ➢ Out of those area	
❖ Hidrology ➢ River ➢ Spring	 ➢ Not interfere the river body ➢ Not interfere the quality and quantity of water source ➢ Not interfere drainage pattern ➢ < 1.5 m from river base ➢ Not interfere river geometric ➢ Not interfere spring resources	
❖ Topography ➢ S l o p e ➢ Elevation	 ➢ Non compacted rock 40% , (22o). Example : clay, sand, bentonite etc. ➢ Compacted rock 100 % (45o). example : limestone, etc. ➢ Elevation more than 1000 above sea level	
❖ Land Use ➢ Settlement Area ➢ Production Fores Area	 ➢ 25 m distance ➢ 100 m distance from road	
❖ Fasility ➢ R o a d ➢ Bridge ➢ Irigasion Chanel	 ➢ 50 m dictance from village road ➢ 100 m distance from regency and province road. ➢ 200 m distance from country road and railway. ➢ 500 m distance upstream and 1000 m distance downstream from the bridge ➢ > 200m distance from the chanel.	

Tabel 2. Separation Minerals of Magnetic Characteristic

Sample Code	Magnetic Weight (gr)	Non magnetic weight (gr)	Total weight (gr)	(%) Magnetic weight (MD)	(%) Non Magnetic weight	Volume Cm3	Specific gravity (BJ)
KBA-1	7,447	17,628	25,675	**29,004**	**68,658**	14,896	**1,72**
KBA-4	8,151	18,084	26,235	**31,069**	**69,930**	14,896	**1,76**
KBA-9	8,604	17,433	26,037	**33,040**	**66,954**	14,896	**1,74**
KBA-10	11,355	16,309	87,664	**40,973**	**58,953**	14,896	**1,85**

Note :
MD - Magnetic Degree
Sparation with magnetic = 200 gauss

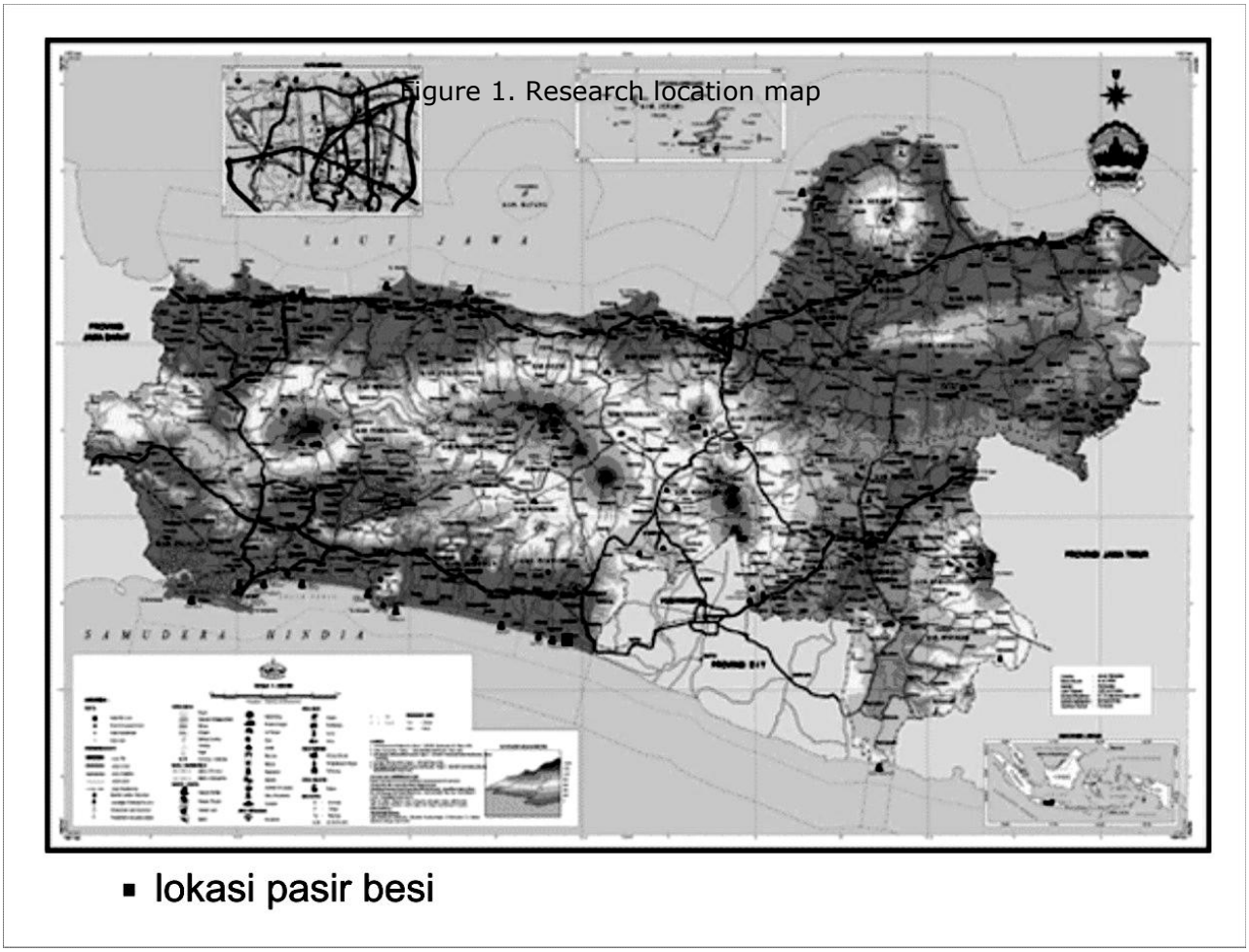


Figure 1. Research location map

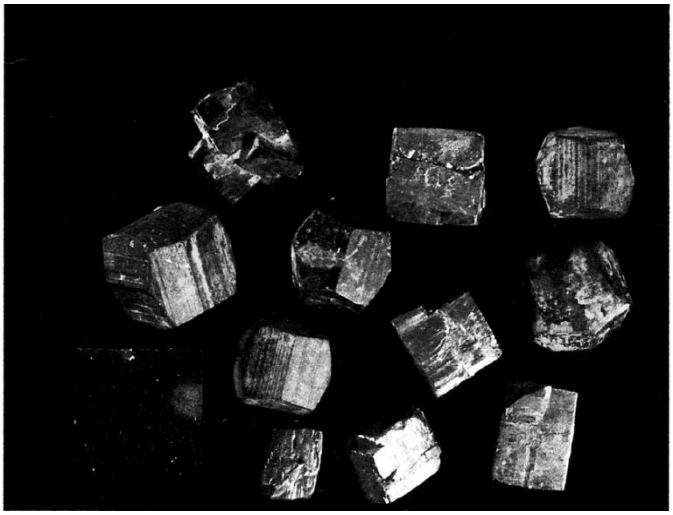


Figure 2. The hematite particle

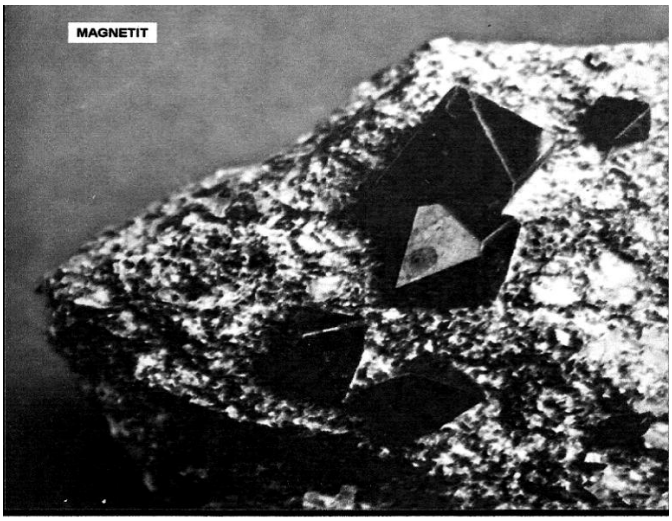


Figure 3. The magnetite particle

Figure 4. The power rig unit

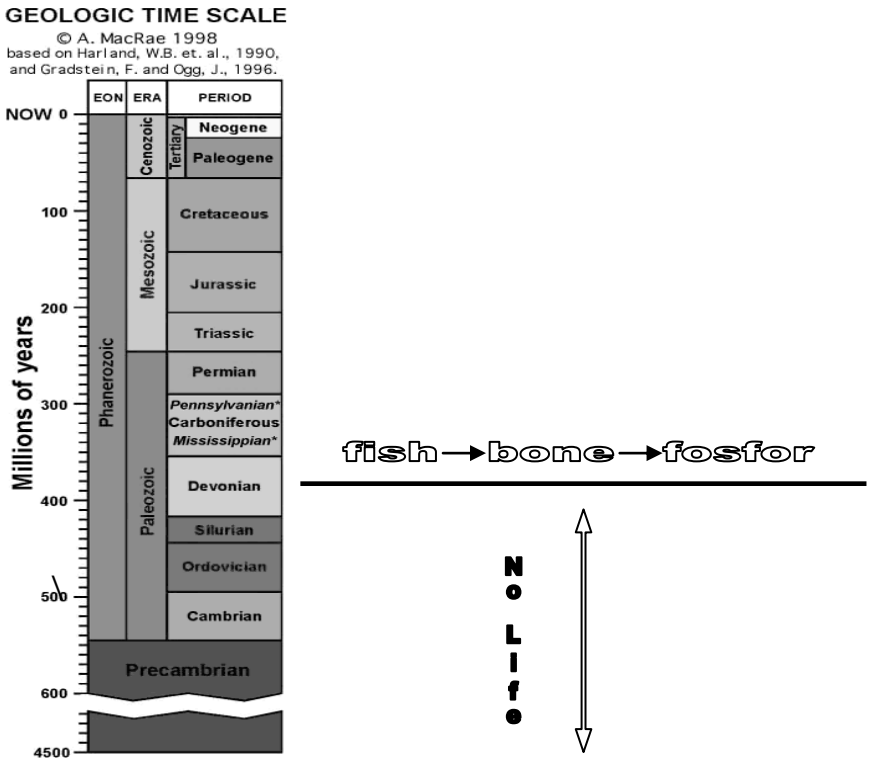


Figure 5. Geologic time scale

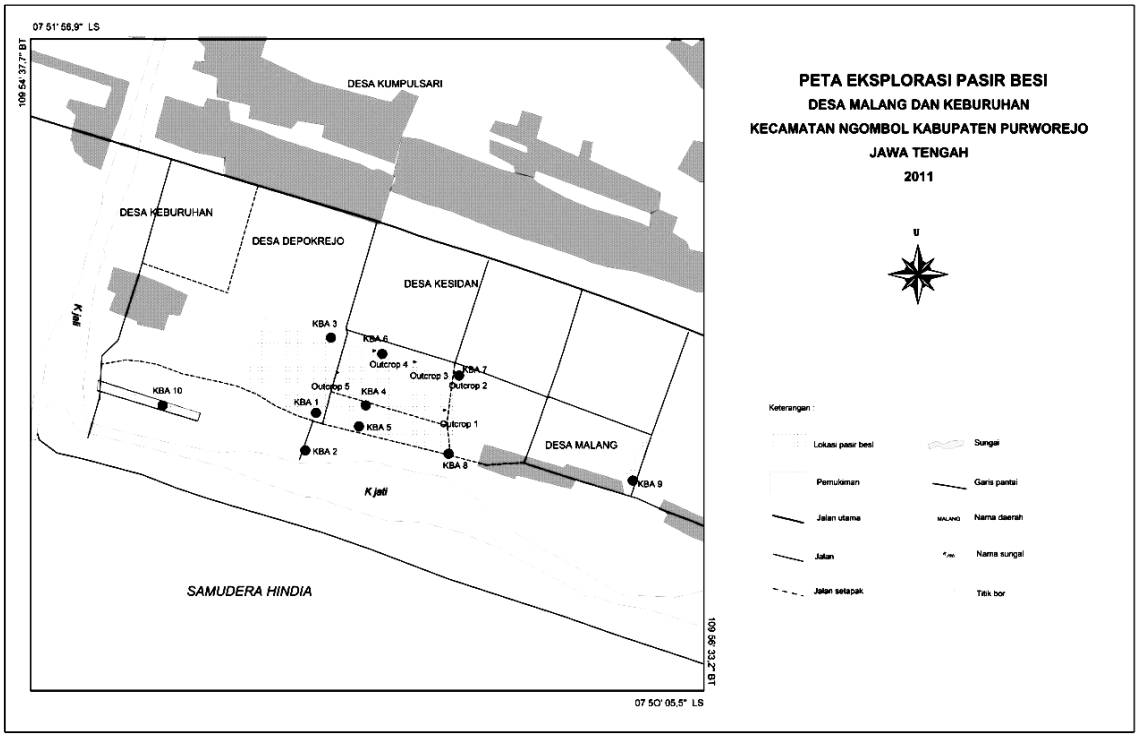
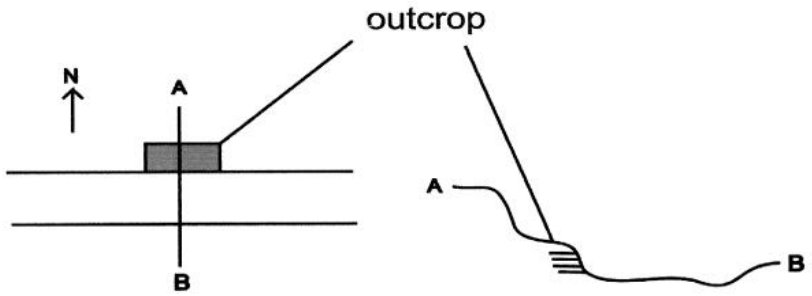


Figure 6. Iron sand exploration map

Outcrop Log

No : 1
Date : Friday , April 15th 2011
Location : Desa Malang
Time : 09.23 AM
Coordinate: 109°55'48,5" E 07°51'11,3" S
Strike/dip : -

Picture :



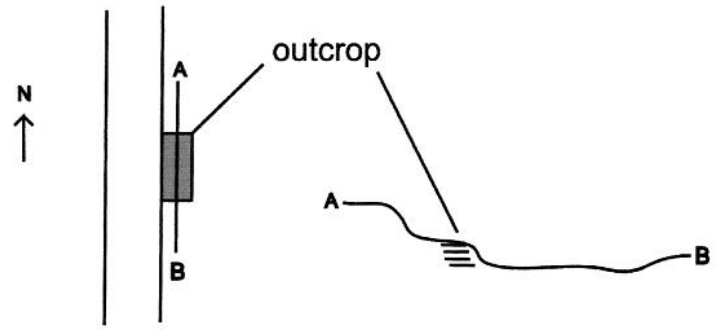
Description:
Color of sand : black , grain shape subrounded – rounded, fine sand – very fine sand, these sand have the same grain size.

Figure 7. Outcrop-1 at Desa Malang

No : 2
Date : Friday ,April 15th 2011
Lokasi : Desa Malang
Time : 09.24 AM

Coordinate: 109°55'47,1" E 07°51'13,9" S
Strike/dip : -

Picture :



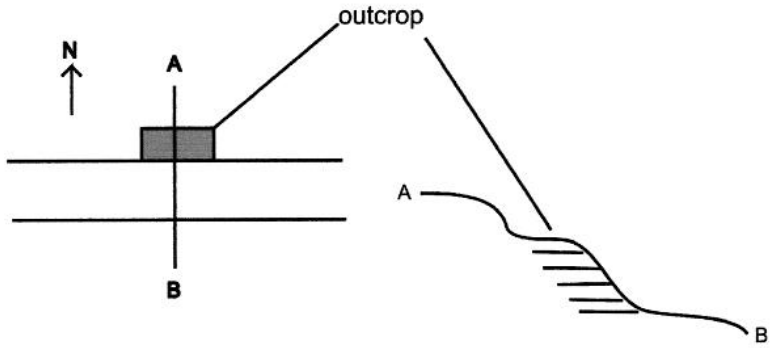
Description :
Color of sand : black , grain shape subrounded – rounded, fine sand – very fine sand, these sand have the same grain size.

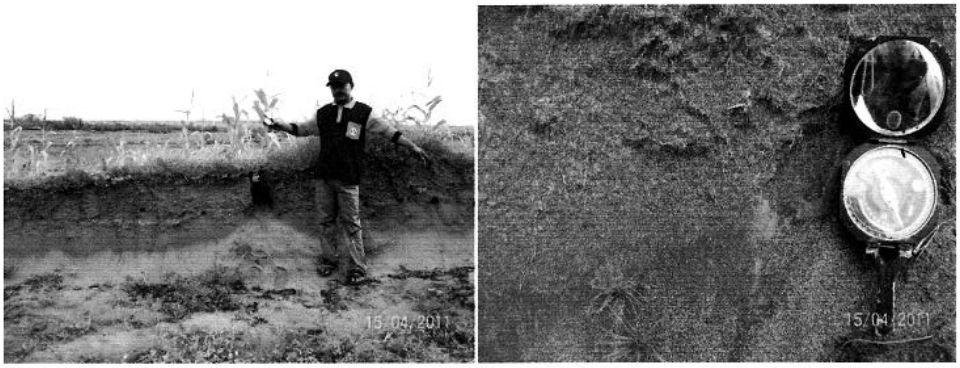
Figure 8. Outcrop-2 at Desa Malang

No : 3
Date : Friday, April 15th 2011
Location : Desa Malang
Time : 09.59 AM

Coordinat : 109°55'42,9" E 07°51'10,3" S
Strike/dip : -

Picture :





Description :
Color of sand : black , grain shape subrounded – rounded, fine sand – very fine sand, these sand have the same grain size.

Figure 9. Outcrop-3 at Desa Malang

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DRILL HOLE LOG

Bor Hole : KBA 1	Start Date : April 9, 2011
Coordinate : X: 109^0 55' 26,4''	Stop date : April 11, 2011
Y: 07^0 51' 09,5''	Machine Type : Power Rig
Z: 37 m	Wellsite : Ryan Akbar Fadhilah

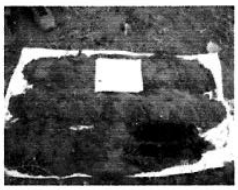
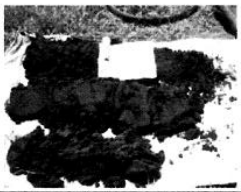
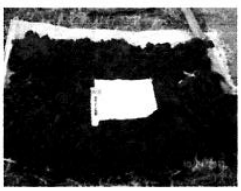
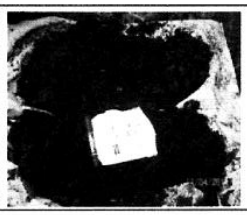
Depth Start	Depth To	Sample Code	Lithology	Description	Fe (%)
0	2	KBA 1 0-2		 Color of sand black – brown, fine sand – very fine sand, grains shape subrounded – rounded, these sand have the same grain size. mafic mineral ± 60%, felsic mineral ± 40%.	18.81
2	4	KBA 1 2-4		 Color of sand black – brown, fine sand – very fine sand, grains shape subrounded – rounded, these sand have the same grain size. mafic mineral ± 60%, felsic mineral ± 40%.	15.61
4	6	KBA 1 4-6		 Color of sand black – brown, fine sand – very fine sand, grains shape subrounded – rounded, these sand have the same grain size. mafic mineral ± 60%, felsic mineral ± 40%.	11.92
6	8	KBA 1 6-8		 Color of sand black – brown, fine sand – very fine sand, grains shape subrounded – rounded, these sand have the same grain size. mafic mineral ± 60%, felsic mineral ± 40%.	12.63
8	10	KBA 1 8-10		 Color of sand black – brown, fine sand – very fine sand, grains shape subrounded – rounded, these sand have the same grain size. mafic mineral ± 60%, felsic mineral ± 40%.	11.52

Figure 10. Log of drill hole