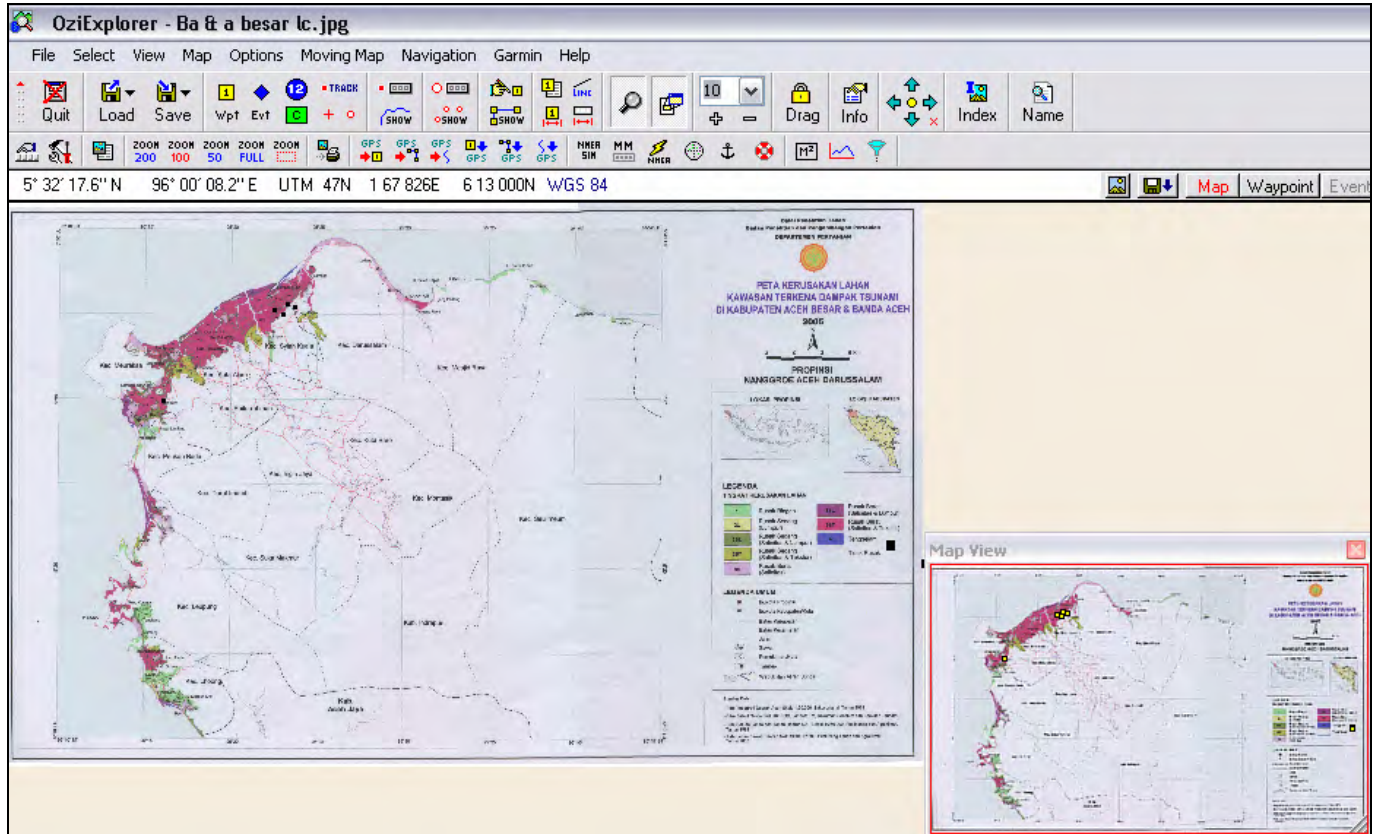


# Earthquake & Tsunami Emergency Support Project

## ETESP

### Digital Maps



No	Map Colour	Legend Code	Damage Description	Damage Type	Kota / Kabupaten / Kecamatan													Totals
					Banda Aceh				Aceh Besar									
					10.Meuraksa	30.Kota Alam	31.Kuta Raja	40.Syah Kuala	10.Lhoong	20.Lhokngna	21.Leumpang	40.Seuleumeum	50.Mesjud Raya	60.Darussalam	61.Baitissalam	120.Peukan Bada		
					Hectares Damaged Areas				Hectares Damaged Areas									
1.0	Light Green	1.0	Light	Salinity	13.4	112.7			126.1	585.4	264.7	368.9	90.1	254.2			28.3	1591.6
2.0	Pale yellow	2L	Medium	Sediment					0.0	66.6	15.3							81.9
3.0	Mild Green	2SL	Medium	Salinity & Sediment	5.5				5.5	153.8	241.0	60.2	6.4				8.0	469.4
4.0	Dark Yellow	2ST	Medium	Salinity & Texture	408.8	259.4			668.2	50.8		55.7				227.0	106.6	440.1
5.0	Pale Mauve	3S	Heavy	Salinity	102.5	109.6		46.5	258.6	236.1	536.5	559.4		257.7	90.5	466.6	342.8	2489.6
6.0	Purple	3SL	Heavy	Salinity & Silt		51.2		208.1	259.3		301.4	166.9				51.3		519.6
7.0	Red	3ST	Heavy	Salinity & Texture	1135.9	1364.5	732.7	1049.0	4282.1	381.2	666.3	766.4		107.0		858.8	626.9	3406.6
8.0	Blue	4.0	Lost	Submerged	21.8	14.7			36.5	21.0	10.8					52.0		83.8
9.0	Speckled	ETESP >20cm Sandy Addition	Sandy	Salinity & Sediment					0.0	46.1								46.1
<b>Totals</b>					1687.9	1912.1	732.7	1303.6	5636.3	1541.0	2036.0	1977.5	96.5	618.9	90.5	1655.7	1112.6	9128.7
									Check-sum	5636.3							Check-sum	9128.7

(Update of May 2006)

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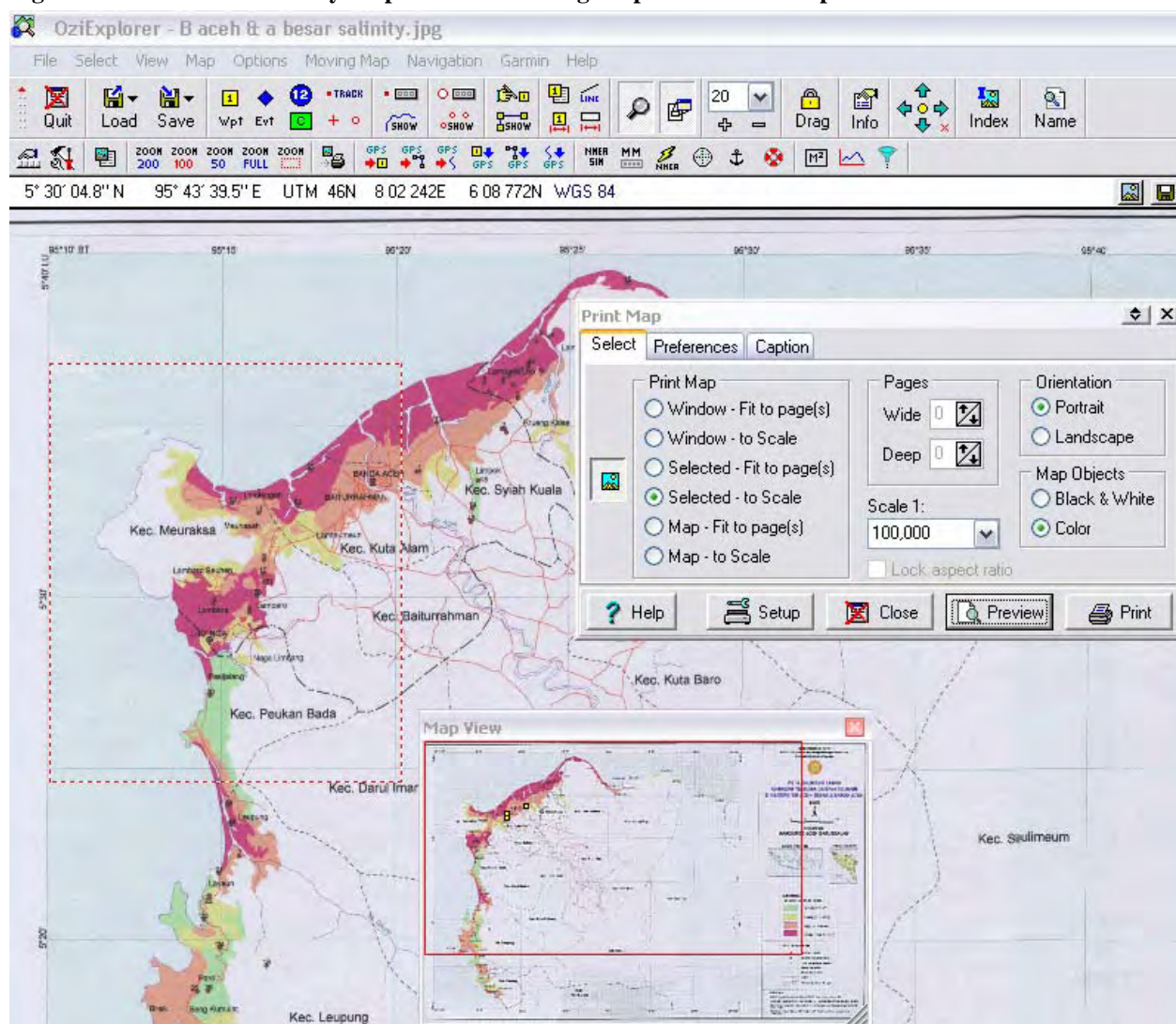
## DIGITAL MAPS

### 1. INTRODUCTION

The ETESP Soil Salinisation and Improvement Specialist has compiled various maps for use on and by ETESP project in a digital format where the maps can be studied, data added, GPS information downloaded and added, plus the maps can be printed out at various scales.

The maps are all listed in Section 3 below. The software used for viewing and working on these maps is GPS mapping software called OziExplorer.

**Figure 1.1 ISRI\* Salinity Map with Print Dialogue open within OziExplorer**



\* ISRI (Indonesian Soil Research Institute), Bogor, 2005

In the above example the area of map "selected" with the red dotted line was printed out at 1:100,000 scale and this fitted an A4 page. Such out-prints can be very useful for field trips and navigation when the whole map may not be available to take to the field.

The OziExplorer programme has been loaded onto one of the ETESP desktop computers and, as this is a "shareware" programme, can be downloaded from [WWW.OziExplorer.com](http://WWW.OziExplorer.com). Alternatively ETESP can supply a copy of OziExplorer on CD with sufficient instructions to install – however, with the size of the JPG image files used a computer with a larger than normal memory is recommended.

## 2. DATA & SOURCES

### 2.1 Topographic maps

Some of the topographic maps were supplied via FAO and are copies of the Bakosurtanal 1:50,000 scale and 1:1250,000 scale maps for much of northern Sumatra but all of the NAD area is NOT covered. Most of these maps are relatively dated but, nonetheless, very useful tools.

More 1:50,000 scale maps were later obtained via an ETESP source in one of the government agencies. The maps supplied from this source filled in and, in some cases, duplicated the FAO sourced maps. The full list of topographic maps available from the ETESP system is shown in Figures 3.1 – 3.3.

### 2.2 ISRI Bogor mapping

Recent, post-tsunami mapping was supplied to ETESP by ISRI (Indonesian Soil Research Institute), Bogor. The thematic maps in this series cover the areas impacted by the tsunami with mapping of:

- Salinity
- Depth of Sediments
- Texture of Sediments and
- Land Classification for the tsunami damage based on the above factors

The full list of ISRI thematic maps is shown in Table 3.1

As noted in Section 3.2 ETESP Agriculture has made certain additions to the ISRI maps to make them more useful in post-tsunami operations. These additions include:

- adding another “damage” class where the deposits are noted as being ‘coarse’ textured
- adding an additional legend giving the areas of the various mapped damage classes by kecamatan

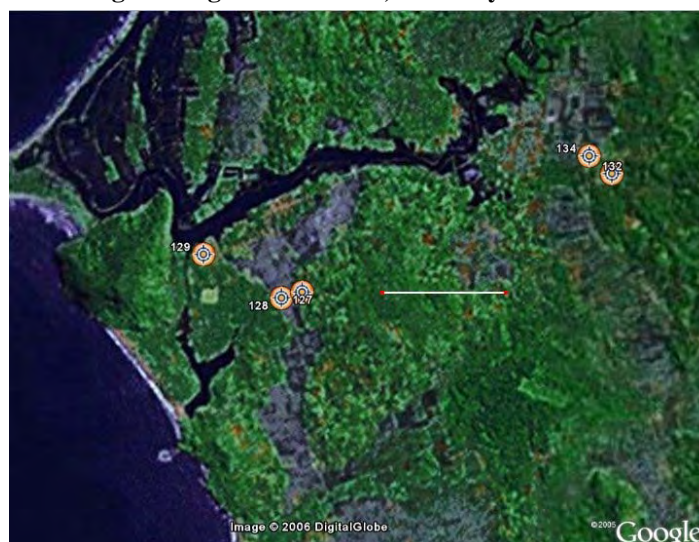
With this update ETESP Agriculture has added the estimates of the extents of the damaged areas mapped. The areas were measured by digitizing in OziExplorer and a legend was compiled in MS Excel and superimposed on the image (JPG) file.

### 2.3 Images from Google Earth

Satellite images are available for “free” download from “Google Earth” on the internet. For a small charge the operator can purchase the right to connect a GPS device to the system and download, or drop, GPS information from the GPS unit onto the images.

ETESP Agriculture has started to do this and has now been able to geo-register some images into and for use with OziExplorer. These images are listed in Table 3.3 and an example is shown As Figure 2.1.

**Figure 2.1 Satellite Image for Krueng Tunong and Lambaro, Aceh Jaya**



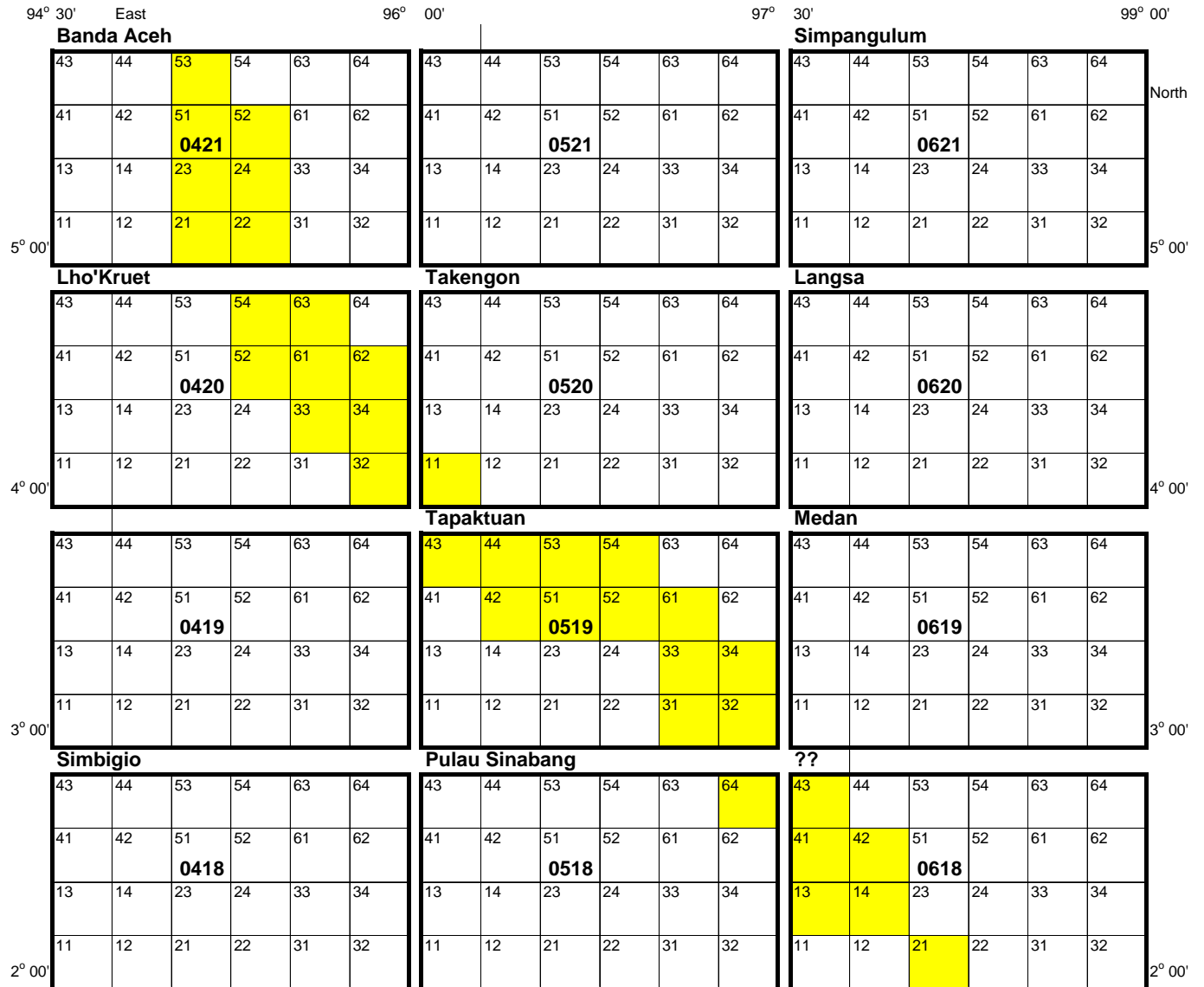
### 3. MAPS AVAILABLE IN OZIEXPLORER

#### 3.1 Topographic Maps

##### 3.1.1 Topographic maps 1:50,000 scale

The 1:50,000 scale maps geo-registered in OziExplorer are shown in Figures 3.1 (FAO sourced) and 3.3 (Other). At present the FAO sourced maps only cover Banda Aceh and Aceh Besar plus down the west coast whilst the other sourced maps complete cover for the full NAD area.

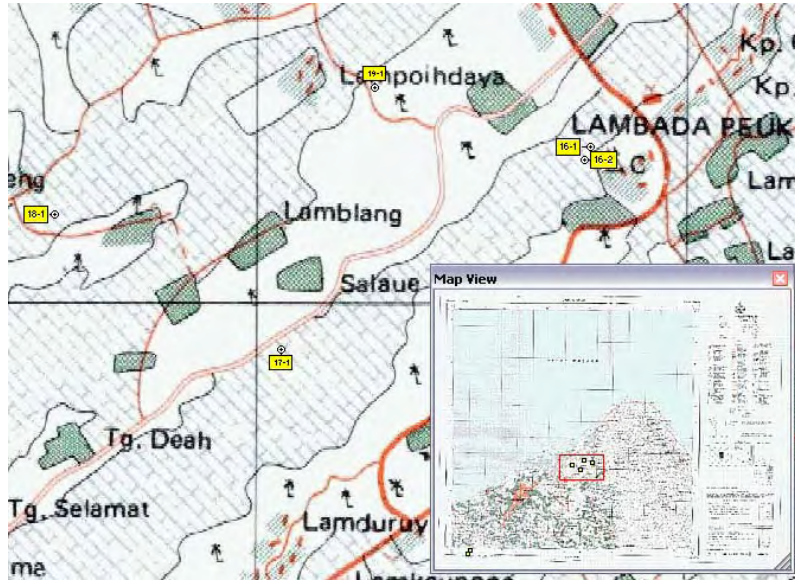
**Figure 3.1 List of FAO sourced 1:50,000 Scale Topomaps Maps Available in ETESP Collection**



Many of these maps have been used in the field and for reporting purposes and data downloaded from GPS devices have proved to be very reliable as to locational accuracy.

Within the digital records the maps are stored in separate directories, or folders, to make working with any specific map using OziExplorer easier.

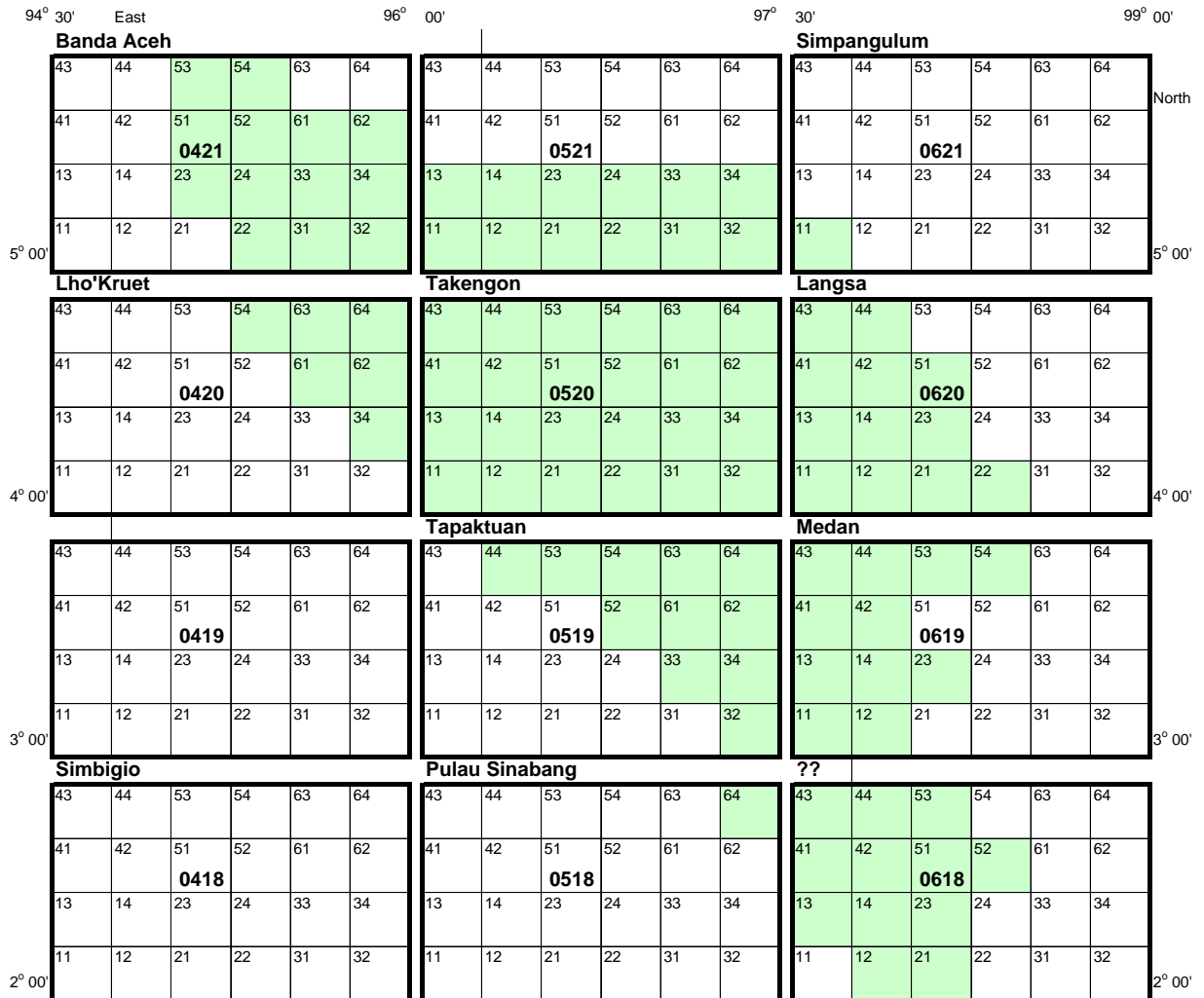
**Figure 3.2 Example of Part of 1:50,000 Scale Topographic Map**



The extract is from the Banda Aceh 1:50,000 scale sheet and shows the sites studied by ACIAR / ISRI during their EM38 salinity survey in Aceh Besar. The data from these sites have been studied by ETESP and are reported by Kabupaten (ETESP 2005).

The site locations, coordinates, were recorded by GPS unit and downloaded directly onto this map in OziExplorer.

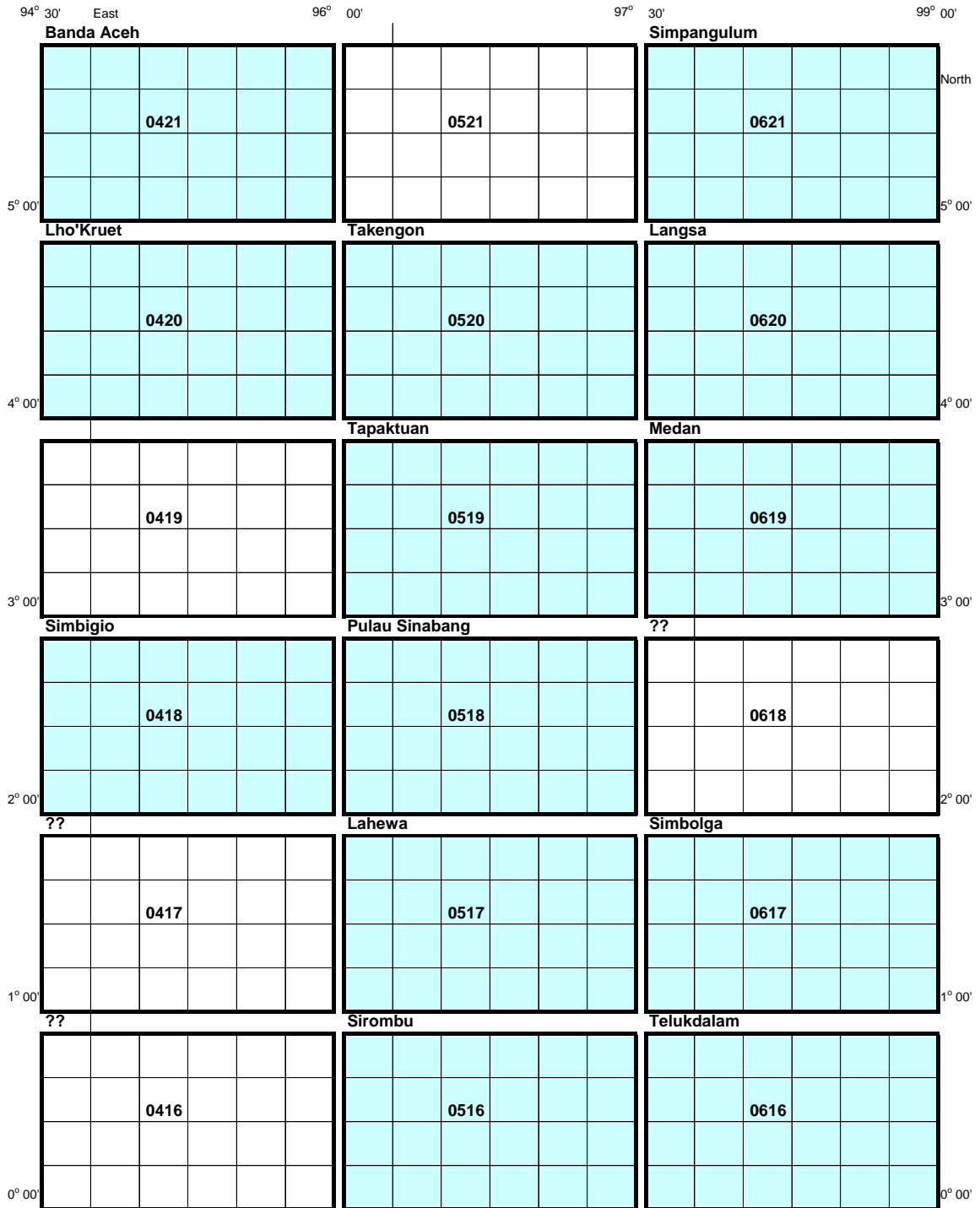
**Figure 3.3 List of other 1:50,000 Scale Topomaps Maps Available in ETESP Collection**



### 3.3.2 1:250,000 scale

As with the FAO-sourced 50,000 scale maps there is not complete coverage from the 1:250,000 maps for the north and east coasts registered in the ETESP system.

**Figure 3.4 List of 1:250,000 Scale Topomaps Maps Available in ETESP Collection**

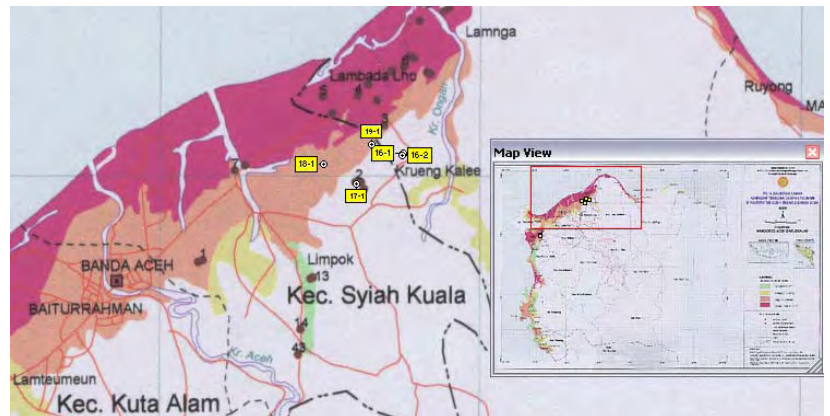


### 3.2 Post Tsunami Maps by ISRI, Bogor

**Table 3.1 ISRI Post-Tsunami Maps**

Aceh Barat LC
Aceh Barat Salinity
Aceh Barat Sediment cm
Aceh Barat texture
Aceh Jaya (N) LC
Aceh Jaya (N) Salinity
Aceh Jaya (N) Sediment cm
Aceh Jaya (N) Texture
Aceh Jaya (S) LC
Aceh Jaya (S) Salinity
Aceh Jaya (S) Sediment cm
Aceh Jaya (S) Texture
Banda Aceh & Aceh Besar LC
Banda Aceh & Aceh Besar Salinity
Banda Aceh & Aceh Besar Sediment cm
Banda Aceh & Aceh Besar Texture

**Figure 3.5 Example of ISRI Salinity Map**



The same sites as shown in Figure 3.2 are shown in Figure 3.5 above

#### 3.2.1 ETESP Addition to Land Damage Maps

As stated above, these maps cover the themes of salinity, sediment depth, sediment texture and a classification of the damage to the land caused by the above factors.

ETESP agriculture component has made two additions to the land damage map. The first addition is an attempt to show the damage, or limitation, caused by deep sandy or coarse textured sediments. A sample of the addition is shown as Figure 3.6 with an explanation of the reasoning given below.

Deep Coarse Textured Sediments: The first addition made by ETESP is shown on the maps with a speckled or dotted pattern as can be seen in parts of Unit 3L in Figure 3.6.

Unit 3 L is heavy or deep sediment cover. However, the sections picked out by ETESP have an additional “damage” or limitation factor in that the deep sediments existing at the sites comprises coarse textured, sandy, material.

The main problems caused by such deposits are:

- Being sandy the soil, or deposit, will have very low ability to store moisture (low AWHC) and hence moisture stress will be suffered by any crop
- Sands have low inherent fertility and have low ability to retain any nutrients that are added (low Cation Exchange Capacity – CEC), and
- Such deep deposits could make previously irrigated land become “out-of-command” if the land level has risen significantly due to the addition of 20+cm of material.

Crops would have to be very carefully chosen with only drought resistant and low nutrient demand types used – unless the sands were physically removed, but this would be an expensive option.

Further expansion of this topic can be found in ETESP reports “Sandy Deposits” and Site Visit Reports to “Red Cross Area, Lambadeuk” and “ETESP Irrigation sites, Lhamno”.

**Figure 3.6 Deep Sandy Sediment Addition (ETESP)**



**Figure 3.7 Legend for Salinity Map**

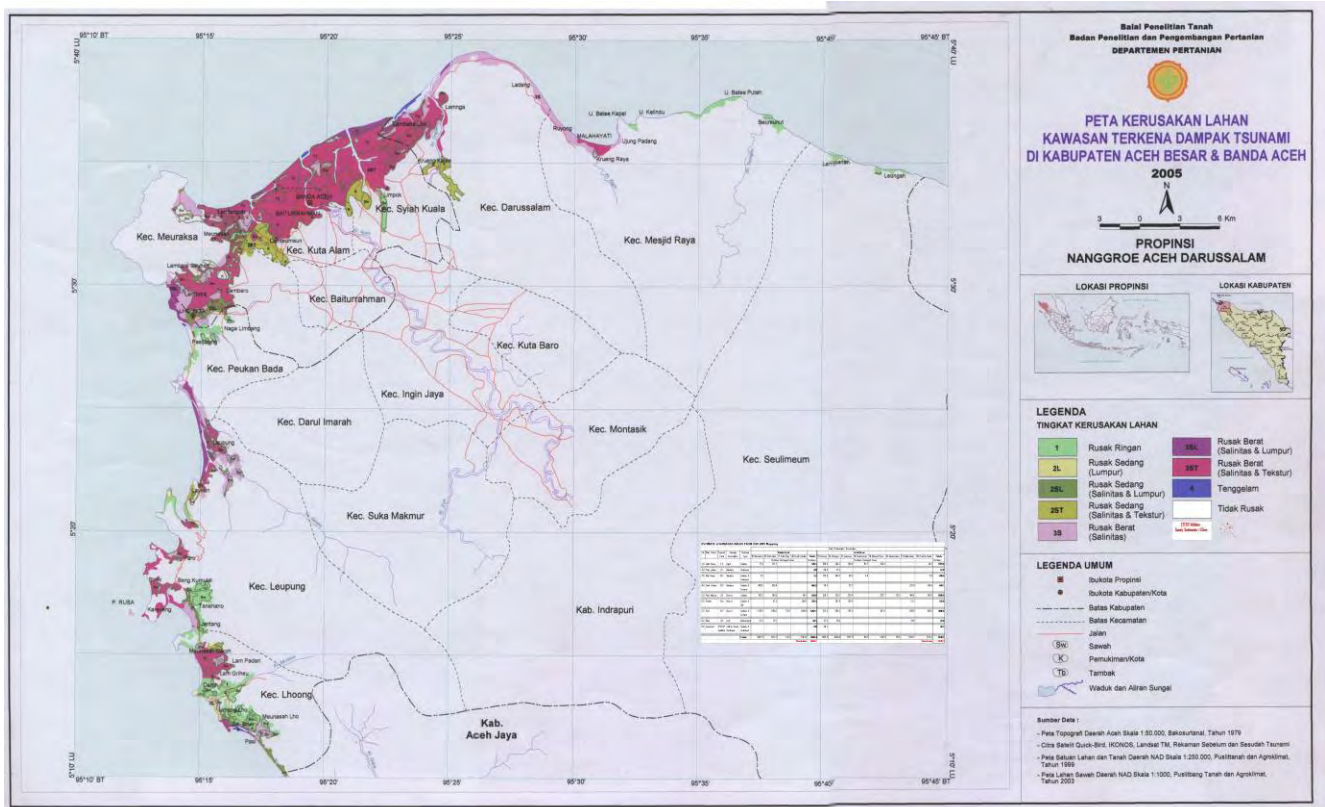




**Extents of Damage:** As of early 2006 there was no map showing the actual extent of damaged areas nor the extent, in hectares of land actually considered damaged.

Accordingly, ETESP Agriculture has measured the “polygons” on the land damage map and produced an additional legend, which is superimposed on the map image, detailing the areas as measured. Each map sheet contains a legend with the areas given by kecamatan, but the boundaries of these units are rather vague and some inaccuracies are to be expected. An example of the new image is shown as Figure 3.8 – note that at this scale the legend cannot be read. Figure 3.9 shows a small extract of a map with the polygon measurements.

**Figure 3.8 Banda Aceh and Aceh Besar Map Image with Additional legend**



**Figure 3.9 Extract of Banda Aceh and Aceh Besar Map Measurements**



The legends produced are presented as Tables 3.2 – 3.4.

**Table 3.2 Legend with Extents for Banda Aceh and Aceh Besar**

No	Map Colour	Legend Code	Damage Description	Damage Type	Kota / Kabupaten / Kecamatan														
					Banda Aceh					Aceh Besar									
					10.Meuraksa	30.Kota Alam	31 Kuta Raja	40.Syah Kualah	Totals	10.Lhoong	20.Lhokgna	21.Leupung	40.Seuleumeum	50.Mesjud Raya	60.Darussalam	61.Baitissalam	120 Peukan Bada	Totals	
					Hectares Damaged Areas				Hectares	Hectares Damaged Areas							Hectares		
1.0	Light Green	1.0	Light	Salinity	13.4	112.7			126.1	585.4	264.7	368.9	90.1	254.2			28.3	1591.6	
2.0	Pale yellow	2L	Medium	Sediment					0.0	66.6	15.3							81.9	
3.0	Mid Green	2SL	Medium	Salinity & Sediment	5.5				5.5	153.8	241.0	60.2	6.4				8.0	469.4	
4.0	Dark Yellow	2ST	Medium	Salinity & Texture	408.8	259.4			668.2	50.8		55.7			227.0		106.6	440.1	
5.0	Pale Mauve	3S	Heavy	Salinity	102.5	109.6		46.5	258.6	236.1	536.5	559.4		257.7	90.5	466.6	342.8	2489.6	
6.0	Purple	3SL	Heavy	Salinity & Silt		51.2		208.1	259.3		301.4	166.9				51.3		519.6	
7.0	Red	3ST	Heavy	Salinity & Texture	1135.9	1364.5	732.7	1049.0	4282.1	381.2	666.3	766.4		107.0		858.8	626.9	3406.6	
8.0	Blue	4.0	Lost	Submerged	21.8	14.7			36.5	21.0	10.8				52.0			83.8	
9.0	Speckled	ETESP	>20cm Sandy Addition Sediment	Salinity & Sediment					0.0	46.1								46.1	
<b>Totals</b>					1687.9	1912.1	732.7	1303.6	5636.3	1541.0	2036.0	1977.5	96.5	618.9	90.5	1655.7	1112.6	9128.7	
									Check-sum	5636.3								Check-sum	9128.7

**Table 3.3 Legend with Extents for and Aceh Jaya**

Kota / Kabupaten / Kecamatan													
No	Map Colour	Legend Code	Damage Description	Damage Type	Aceh Jaya							Totals Hectares	
					10 Teunom	20 Panga	30 Krueng Sabee	40 Setia Bakti	50 Sampoiniet (N sheet)	50 Sampoiniet (S sheet)	50 Sampoiniet		60 Jaya
					Hectares Damaged Areas								
1	Light Green	1	Light	Salinity	1366.4	0.0	1015.9	728.3	778.4	32.2	810.6	1422.7	5343.9
2	Pale Yellow	2L	Medium	Sediment	245.5	1713.2		41.6	132.5	35.1	167.6	471.8	2639.7
3	Pink	2S	Medium	Salinity	62.3		4.5		7.5	17.0	24.5	86.1	177.4
4	Mid Green	2SL	Medium	Salinity & Sediment	346.1	437.9	229.9	568.1	1952.6	83.6	2036.2	294.8	3913.0
5	Pale Mauve	3L	Heavy	Sediment	495.6	555.9	779.4	360.2	369.5	169.9	539.4	1575.9	4306.4
6	Pale Mauve Speckled	3LT	Heavy	Sediment & Sandy	387.6	207.9	90.7	65.5				127.9	879.6
7	Mid Mauve	3S	Heavy	Salinity	52.6		74.1	180.6	501.4	83.1	584.5	1311.2	2203.0
7	Purple	3SL	Heavy	Salinity & Sediment	13.0			176.4	48.0	55.4	103.4	228.3	521.1
8	Purple Speckled	3SLT	Heavy	Salinity, Sediment & Sandy					17.9		17.9		17.9
10	Orange	3Pm	Heavy	Settlements	93.4	46.1	80.9	177.8	122.3	6.7	129.0	107.7	634.9
11	Orange Speckled	3PmT	Heavy	Settlements + Sands								12.8	12.8
12	Blue	4.0	Lost	Submerged								47.1	47.1
<b>Totals</b>					3062.5	2961.0	2275.4	2298.5	3930.1	483.0	4413.1	5686.3	20696.8
<b>Check-sum</b>												<b>20696.8</b>	

**Table 3.4 Legend with Extents for and Aceh Barat**

No	Map Colour	Legend Code	Damage Description	Damage Type	Kota / Kabupaten / Kecamatan				
					Aceh Barat				
					50 Johan Pahlawan	60 Samatiga	62 Arongan Lambalek	81 Meurobo	Totals
					Hectares Damaged Areas				Hectares
1	Light Green	1	Light	Salinity	68.9	1335.6	1378.3	760.0	3542.8
2	Pale Yellow	2L	Medium	Sediment	309.6	345.0	1771.8	394.2	2820.6
3	Pink	2S	Medium	Salinity	3.2	401.6		282.2	687.0
4	Mid Green	2SL	Medium	Salinity & Sediment	231.4	728.1		1613.7	2573.2
5	Pale Mauve	3L	Heavy	Sediment		378.5	729.2	44.9	1152.6
6	Pale Mauve Speckled	3LT	Heavy	Sediment & Sandy	3.8	653.4		32.4	689.6
7	Mid Mauve	3S	Heavy	Salinity	23.3	41.7		151.6	216.6
8	Mid mauve speckled	3ST	Heavy	Salinity & Texture		42.3			42.3
10	Purple Speckled	3SLT	Heavy	Salinity, Sediment & Sandy	267.4	16.5		345.6	629.5
14	Blue	4.0	Lost	Submerged	123.3	238.5	51.0	218.9	631.7
				<b>Totals</b>	1030.9	4181.2	3930.3	3843.5	12985.9
								<b>Check-sum</b>	<b>12985.9</b>

## 4. USING OZIEXPLORER

Your first step is to install the Ozi Explorer programme on Drive C:\ of your computer.

- Just double-click the “programme icon” in the folder -
- Only install the programme PLUS sample maps – the rest will not work
- Once installed, open the programme and look in HELP for ENTER REGISTRATION code (SERIAL NUMBER and PASSWORD). There is a word file in the OziExplorer folder with password etc.
- When programme is installed you then need to complete the CONFIGURATION section under the File Menu

**Figure 4.1 OziExplorer Installation Icon**



The programme comes with a good help menu and much of what has to be done is intuitive and no attempt is made here to present a users guide.

Once maps are registered into the programme data can be downloaded to the map image from GPS and, conversely, data on the computer can be uploaded to a GPS device. GPS tracks and waypoints are most useful in situations as experienced on ETESP but many people have GPS devices but cannot make full use of the data collected.

New road alignments, survey sites and boundaries can all be compiled onto the map with a fair degree of accuracy.

Once compiled, new maps can be printed out at various scales via a selection tool (refer Figure 1) in the print menu – this is most useful when detailed scale maps are required for field-work and the only available maps are at the totally wrong scale. With a good quality printer or plotter, maps printed from this software at selected scales are at the claimed scale – assuming the original map was correctly geo-registered in the first place.

## 5. ACKNOWLEDGEMENTS and REFERENCES

### 5.1 Acknowledgements

As and when use of these maps is made the original authors or publishers should be acknowledged.

### 5.2 References & ETESP Reports & Tools

#### 5.2.1 References

ISRI 2005

Atlas, Peta Lahan Pertanian, Terkena Dampak Tsunami, Propinsi Nanggroe Aceh Darussalam 2005, Departemen Pertanian 2005

#### 5.2.2 ETESP Soil Desalinisation and Improvement Reports

##### A Technical Data Reports

ETESP Agricultural Component, Desalinisation & Soil Improvement, Mobilisation Report, OCTOBER 2005, Updated FEBRUARY 2006

ETESP, Banda Aceh Kota, Kuta Alam, Data Assessment and Soil Reclamation, NOVEMBER 2005

ETESP, Aceh Besar Kabupaten, *Lhoknga, Darussalam and Baitissalam*, Data Assessment and Soil Reclamation, DECEMBER 2005

ETESP, Pidie Kabupaten, *Meureudu, Triang Gadeng, Panteraja and Simpang Tiga*, Data Assessment and Soil Reclamation, DECEMBER 2005

ETESP, Bireuen Kabupaten, *Samalanga, Jeunieb, Jeumpa, Jangka and Ganda Pura*, Data Assessment and Soil Reclamation, DECEMBER 2005

ETESP, Executive Summary, Soil and Land Reclamation, DECEMBER 2005

ETESP, Soil and Land Reclamation Scenarios, DECEMBER 2005, Updated March 2006

ETESP, Interpretation of Laboratory Data for ETESP Irrigation Component, FEBRUARY 2006

##### B Background Technical Papers

ETESP, Background Paper, Annual & Monthly Rainfall, OCTOBER 2005

ETESP, Background Paper, Soil Acidity and Aluminium, DECEMBER 2005

ETESP, Digital Maps, FEBRUARY 2006, Update MARCH 2006

ETESP, Sandy Sediments, FEBRUARY 2006

ETESP, Soil Conditions for Wetland Rice, MARCH 2006

##### C Site Visit and Tour Reports

ETESP, Site Visit Report – BRR Area at Lhoong: Kemukiman Cot Jeumpa, DECEMBER 2005

ETESP, Site Visit report, BLANG KREUNG SITE, DECEMBER 2005

ETESP, Tour Report, Field Tour Report NAD Areas, Feb 20<sup>th</sup> – Feb 24th 2006, FEBRUARY 2006

ETESP, Site Visit Report, Visit to Oxfam Sites Calang, MARCH 2006

ETESP, Site Visit Report, Visit to Red Cross Site, Aceh Besar, MARCH 2006

ETESP, Site Visit Report, Lhamno Irrigation Sites, Aceh Jaya, MARCH 2006

### 5.2.3 ETESP Soil Desalinisation and Improvement Tools

File name and date	Purpose
ETESP ECe from EM38 data.XLS OCTOBER 2005	Calculate soil salinity (ECe) values from raw data collected by EM38 salinity device when no calibration information provided
ETESP Leaching Water Requirements.XLS NOVEMBER 2005	Calculate the depths and volumes of water that have to be applied and pass through a selected depth of soil to achieve desalinisation. Information required includes: <ul style="list-style-type: none"> <li>• Textural class of soil</li> <li>• Initial salinity of the soil (dS/m)</li> <li>• Target salinity wished to be achieved (dS/m)</li> </ul>
ETESP Irrigation Leaching Progress.XLS NOVEMBER 2005	Determine how many irrigation gifts have to be applied to achieve de-salinisation of various depths of variously textured soil. Information required includes: <ul style="list-style-type: none"> <li>• Soil textural group, or</li> <li>• AWHC (Available Water Holding Capacity)</li> <li>• Estimate of water application efficiency, or use default values</li> <li>• Size of irrigation gift as mm of water</li> </ul>
ETESP Survey Density.XLS DECEMBER 2005	<ol style="list-style-type: none"> <li>1. Correlate the scale at which to map surveys of various types from reconnaissance to very detailed level</li> <li>2. Determine observation density (Sites / hectare)</li> <li>3. Calculate the total number of sites for surveys at various reliability levels</li> </ol> <p>Requirements:</p> <ul style="list-style-type: none"> <li>• Survey area extent in hectares (ha)</li> </ul> <p>Also presents various map and mapping information</p>
ETESP Labdata summary.XLS Version 4 FEBRUARY 2006	Enter standard laboratory data and obtain ratings as to the level of all the various nutrients and chemical properties. <p>Also calculate weighted mean vales for topsoil and subsoil plus obtain automatic simple summary of:</p> <ul style="list-style-type: none"> <li>• Inherent fertility</li> <li>• Fertility potential</li> <li>• Possible nutrient deficiencies</li> <li>• Salinity status, and</li> <li>• Reaction</li> </ul> <p>Also experimental estimate of possible perceived risks</p>
ETESP Site Monitoring tool.XLS March 2006	Enter field data for specific sites or villages making note of : <ol style="list-style-type: none"> <li>1. <u>Locational information</u> <ul style="list-style-type: none"> <li>• Kabupaten</li> <li>• Kecamatan</li> <li>• Desa</li> <li>• Farmer or Land-owner, and</li> <li>• Geographic coordinates</li> </ul> </li> <li>2. <u>Soil, land and crop features</u> <ul style="list-style-type: none"> <li>• surface soil textural group</li> <li>• soil salinity</li> <li>• soil acidity</li> <li>• irrigation water quality (salinity)</li> <li>• status of drains, plus</li> <li>• estimate (%) of the actual pre-tsunami crop yield</li> </ul> </li> </ol> <p>to monitor land reclamation progress and get information on further interventions possibly required</p>

<p>ETESP Soil Conditions Database tool.XLS March 2006</p>	<p>Enter field collected on the site form, or data collated and analysed from the data on the site form into a format that will be the first stages of a dbms / GIS compilation:</p> <ul style="list-style-type: none"><li>• surface soil textural group</li><li>• soil salinity</li><li>• soil acidity</li><li>• irrigation water quality (salinity)</li><li>• status of drains, plus</li><li>• estimate (%) of the actual pre-tsunami crop yield</li></ul> <p>The data are stored against the official Dinas selected villages that qualify for ETESP inputs. This collation will allow monitoring land reclamation progress within kecamatan and kabupaten and get information on further interventions possibly required</p>
<p>ETESP Auger Description Form</p>	<p>Simple pro-forma for recording data collected during soil investigations to establish depths and distribution of sandy sediments</p>