

INTERNATIONAL CONFERENCE



The Second International Conference on
Engineering and Technology Development

2nd ICETD 2013

27, 28, 29 August 2013, Bandar Lampung, Indonesia



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2nd ICETD 2013

THE SECOND INTERNATIONAL CONFERENCE
ON ENGINEERING AND TECHNOLOGY DEVELOPMENT

28 -30 January 2013
Bandar Lampung University (UBL)
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PREFACE

The Activities of the International Conference is in line and very appropriate with the vision and mission of Bandar Lampung University (UBL) to promote training and education as well as research in these areas.

On behalf of the Second International Conference on Engineering and Technology Development (2nd ICETD 2013) organizing committee, we are very pleased with the very good response especially from the keynote speaker and from the participans. It is noteworthy to point out that about 80 technical papers were received for this conference.

The participants of the conference come from many well known universities, among others : University Kebangsaan Malaysia – Malaysia, APTIKOM – Indonesia, Institut Teknologi sepuluh November – Indonesia, Surya Institute – Indonesia, International Islamic University – Malaysia, STMIK Mitra Lampung – lampung, Bandung Institut of Technology – Bandung, Lecture of The Malahayati University, B2TP – BPPT Researcher – lampung, Starch Technology Center – Lampung, Universitas Islam Indonesia – Indonesia, Politeknik Negeri Malang – Malang, University of Kitakyushu – Japan, Gadjah Mada University – Indonesia, Universitas Malahayati – Lampung, Lampung University – lampung, Starch Technology Center – Lampung, Universitas Riau – Riau, Hasanuddin University – Indonesia, Diponegoro University – Indonesia, King Abdulaziz University – Saudi Arabia, Parahyangan Catholic University – Indonesia , National Taiwan University–Taiwan, Surakarta Christian University – Indonesia, Sugijapranata Catholic University – Indonesia, Semarang University – Indonesia, University of Brawijaya – Indonesia, PPKIA Tarakanita Rahmawati – Indonesia, Kyushu University, Fukuoka – Japan, Science and Technology Beijing – China, Institut Teknologi Sepuluh Nopember – Surabaya, Researcher of Starch Technology Center, Universitas Muhammadiyah Metro – Metro, National University of Malaysia – Malaysia.

I would like to express my deepest gratitude to the International Advisory Board members, sponsor and also to all keynote speakers and all participants. I am also gratefull to all organizing committee and all of the reviewers who contribute to the high standard of the conference. Also I would like to express my deepest gratitude to the Rector of Bandar Lampung University (UBL) who give us endless support to these activities, so that the conference can be administrated on time

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ALTERNATIVE ANALYSIS OF FLOOD CONTROL DOWNSTREAM OF WAY SEKAMPUNG RIVER

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Abstract-Downstream part of the watershed is an area of lowland Sekampung with +3.00 to +4.00 elevation above sea level. Area located between the border regions of South Lampung regency and East Lampung. Originally this area was flooded reservoir area, the Swamp Sragi and surrounding areas, but along with the development of this area is used as a residential area, pertaniandan pond area for the people around the area. Padatahun 2002 River Way Sekampung experience overflow caused flooding in downstream areas which suffered losses of up to 38 billion rupiah. In this study analyzed the incidence of flooding that may occur based on rainfall data available. Based on the results of the input stream and cross sectional design flood discharge is seen that when the flood began when the river reaches flood discharge Q50-year anniversary.

In this study flood control analysis performed on the three methods are: the construction of levees, making retention ponds and dredge rivers. The third input method results in HEC RAS 3.1.3 shows that building levees to reduce flooding by 32%, on a flood retention pond can be reduced up to 45% and normalization of the river is only able to reduce flooding by 20%. Most effective flood management recommendation is to build two retention ponds and technical cost reduction by flooding.

Keywords: Floods, Levees, Retention Pool, Normalization River, Investment Costs

INTRODUCTION

Way Sekampung is the largest river in the province of Lampung flow region covers three districts namely: East Lampung and South Lampung regency Tanggamus. With high intensity rainfall River Way Sekampung often cause flooding to the area - the area through which the flow. Natural conditions that cause decreased function Way Sekampung is the main factor for the flood event. Where the River Way Sekampung no longer have the capacity to normal reservoir, the decrease in the capacity of certain moments when the rain came down with a high intensity and a very long time the incident was unavoidable flooding occurred in the area around the river.

RESEARCH OBJECTIVES

The study objectives are:

- a. Minimize flood inundation that occurred in River Way Sekampung with river flow regulation.
- b. Recommend technical handling a proposal / concept in river flood Way Sekampung Downstream.

LITERATURE REVIEW

1. Steady flow

Components in the model used to calculate the water surface profile in steady flow conditions (steady). This system can be used on a channel, network or a large network of small channels including channels and other. Steady component of the flow can be modeled on the condition of subcritical flow, supercritical, and the combined system water level profile.

Basic computer calculations based on the solution of one-dimensional energy. Energy lost due to friction (Manning

equation) and the constriction and dilation (additional coefficients of the change in speed). Momentum equations useful in situations where the water surface profile changes abruptly. These situations include the combined flow calculation system (example: water jump) or flow on the bridge and changes in water level at the confluence of the channel (the flow at the intersection).

2. Unsteady flow

Components to be developed for the flow is not steady subcritical flow calculations. Hydraulic calculations for cross-sections, bridges, culverts and other hydraulic structures that were developed for the steady flow component coupled with no steady flow calculations. Components for steady flow is not used to model the hydraulic reservoir and relationship with catch.

3. Water Front profile on Steady Flow

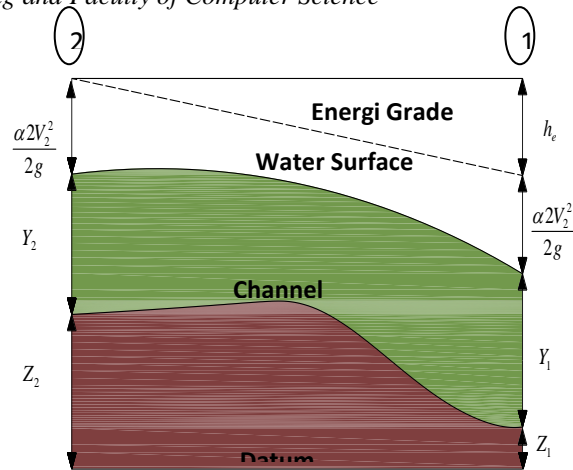
HEC - RAS can calculate water surface profiles for one-dimensional flow gradually lasting change on natural and artificial channels. Subcritical flow, supercritical, and the combined system flow water surface profiles can be analyzed

4. Basic equations

5.

Water surface profiles are computed from a cross-section to the next cross-section energy equation solved by the so-called

Metode Step Standar



Energy equation can be seen as follows:

$$Y_2 + Z_2 + \frac{\alpha_2 v_2^2}{2g} = Y_1 + Z_1 + \frac{\alpha_1 v_1^2}{2g} + h_e$$

Gambar 1. Parameter Penyusunan Persamaan Energi

Figur 1. Energy lines

Information :

Y_1, Y_2 = high depth on cross-section 1 and 2 (m)

Z_1, z_2 = channel base elevation at cross-section 1 and 2 (m)

α_1, α_2 = speed coefficient

v_1, v_2 = speed (m/dt)

g = gravitasi (m/det²)

h_e = loss of energy (m)

Head loss (h_e) between 2 cross section due to friction caused by the loss and loss due to narrowing or widening.

Head loss equation is as follows:

$$h_e = L + \bar{S}_f \left[\frac{\alpha_2 v_2^2}{2g} - \frac{\alpha_1 v_1^2}{2g} \right] \quad (2)$$

Information :

H_e = Head loss (m)

L = friction length field of 2 points observation (m)

C = Loss coefficient due constriction and dilation

α_1, α_2 = speed coefficient

V_1, V_2 = speed (m/det)

G = gravitasi (m/det²)

A = wet cross-sectional area (cross
section) sub area

R = hydraulic radius for the sub area

Calculation of the discharge cross-section in each stream section

Determination of total discharge and velocity coefficients for a cross section requires the division of the flow into the units because the flow velocity is not distributed evenly. In the HEC-RAS approach used is the division of the area on the levee area using constraints n values that exist in the cross-section (location where the value of n changes) as the basis for the division. Discharge is calculated within each sub-area in the levee Manning formula is used (in metric units) are as follows:

$$Q = k \cdot S_f^{1/2} \quad (3)$$

$$k = \frac{1,486}{n} AR^{2/3} \quad (4)$$

Keterangan :

Q = discharge

K = drainage coefficient for the sub-area

S_f = slope of the riverbed

n = Manning roughness coefficient for
sub area

METHODOLOGY

1. Data Collection

Data obtained from secondary data in the form of daily rainfall data and data on river elevation. Detailed data required in this study are as follows:

a. Rainfall Data

Rainfall data obtained from local observation stations obtained from Dinas PU Lampung Province Irrigation Station Unit One Village Seputih River Region, namely Argoguruh Station, Gedong Tataan, Jabung, Pagelaran and Palas Jaya. These data taken 13 years to determine the rainfall observations and debit plan in accordance with the plan of the steps in the flow chart scrutiny.

b. Map Location of Study

Maps used in this study is a map of the location and area of flood inundation maps that occurred in the area of the River Way Sekampung area of sub-watershed particularly Way Sekampung Downstream.

c. River Elevation Data

River elevation data specific to the needs of the use of HEC-RAS 3.1.3 software in simulation of flood events based on discharge plan with the elevation of the river can be seen the river flow profiles used in this study.

2. Data analysis

The data has been collected and then transferred into a spreadsheet for easy

classification and code data, to facilitate data analysis stages.

Data analysis includes the presentation of the data into tables, graphs and pictures, then do the calculations to describe the data obtained. This analysis includes the calculation of hydrology, hydraulics, and economic analysis of levee stability.

RESULTS OF RESEARCH

In this study conducted an analysis of the planned flood mitigation methods will be used. The method is planned to be analyzed is the method of construction of the levee, making retention ponds and dredging rivers dredging the river bed.

3. Flood Prevention with Levee

Surveillance embankment height is determined by the provisions contained in table 2.6 are based on the value of flood discharge. Based on the results of running Hec Ras 3.1.3 for flood discharge when repeated 2, 5, 10, 50 and 100 years has a maximum flow and minimum flow m^3/sec 2208.99 1138.83 m^3/sec .

Based on the value of discharge between 500-2000 m^3/sec adalah 1 m high levee surveillance and to discharge 2000-5000 m^3/sec used 1.2 m high levee surveillance.

As for the subsequent calculations, the width of the dike lighthouse is determined by the width of the table 3.7 mercu embankment to discharge between 500-2000 m^3/sec planned about 4 m and to discharge between 2000-5000 m^3/sec summit planned levee width 5 m.

Levee to be built on the riverside of the runoff occurs. Based on the results of running the program HEC RAS 3.1.3 overflowing river had begun at the time of the flood discharge Q50 year to cross 23-11.4, while the cross under 11.4 despite relatively safe from flooding for up to Q100 year flood discharge.

Planning results back levee height entered into the program HEC RAS 3.1.3 to determine the water surface profile after being added to the levee on the right and left of the cliff and the river levee know the security given to the dangers of flooding.

Levee conditions are safe from the danger of flooding if the elevation levee is greater than the water level. Graphics capabilities using the levee on the river after 23 to Q50-year cross can be seen in the picture below.

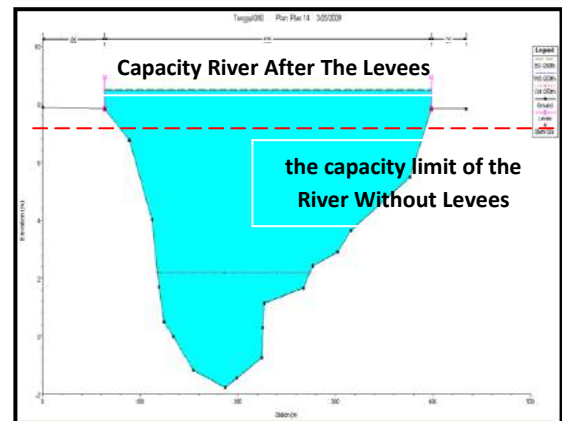


Figure 2. the condition cross-section in After levee

4. Flood Prevention With Retention Pool

A retention pool is able to reduce up to 45.901% flood to flood the Q50 and 45.894% for the flooding that occurred in Q100. Retention Pool B has the ability to reduce up to 37.945% and 29.27% for Q50 on Q100. Hal This occurs because the area around the pool Retention B has a greater volume of flood pool is designed so that only reduce flooding and up to 37.945% 29.277% only

CONCLUSION

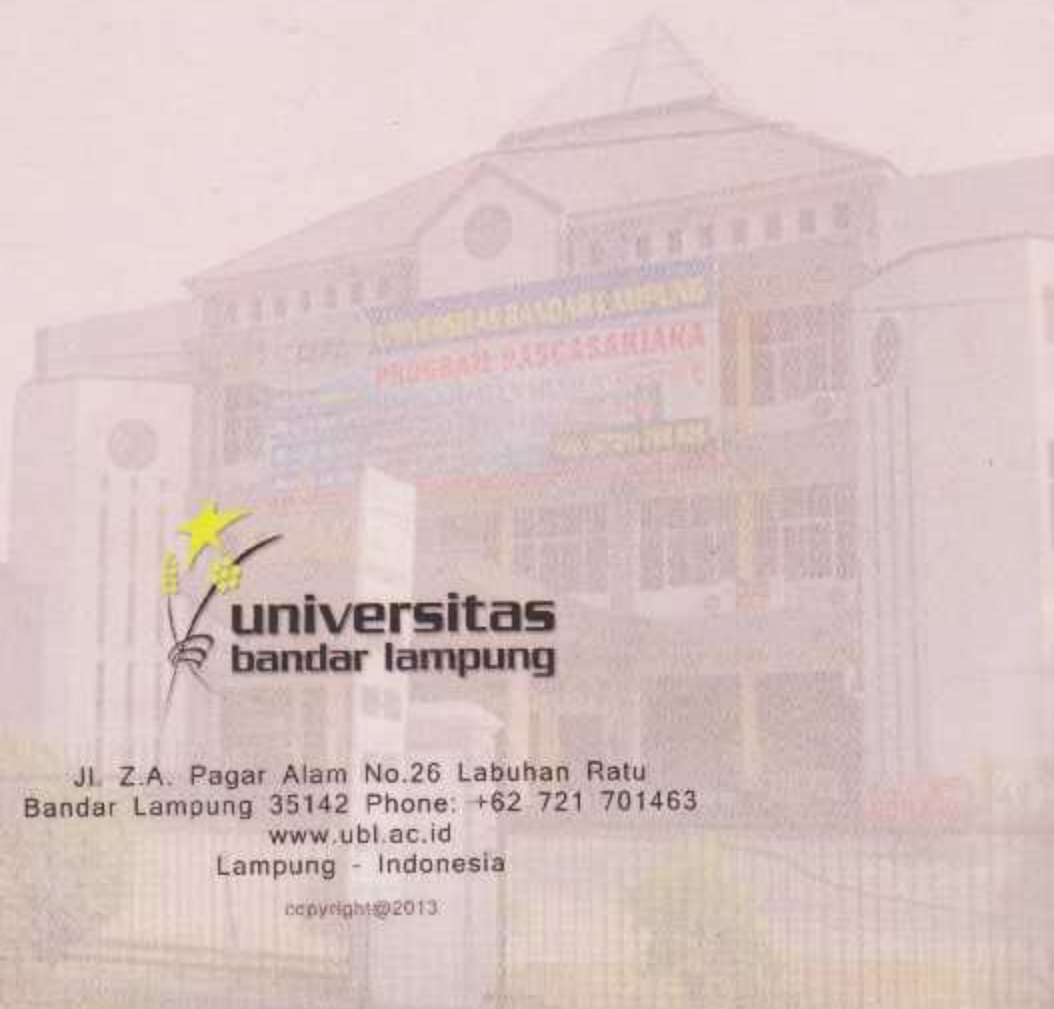
Based on the results of our study on the incidence of flooding in the lower reaches of the River Way Sekampung we can conclude the following:

1. Method of handling the flood levee could reduce flooding by 32% maximum. Manufacture of Retention pool is able to reduce up to 45% while the River Normalization only reduce flooding with a maximum value of 20% reduction.
2. Based on the results of the simulation with the program HEC RAS 3.1.3 handling most have economic value and be able to provide optimum value reduction of 45% is to create a retention pool.
3. Having made retention pool and streams in the planned percentage reduction normalize flooding able to reach 65%

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