2D FLOW SIMULATION FOR THE UPSTREAM SIDE OF NAGARJUNA SAGAR RESERVOIR USING HEC-RAS

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Abstract: HEC-RAS is software useful to do the 2D Flow Simulation. HEC-RAS is one of the simplest and oldest software for Simulation of River Flow. The Hydrologic Engineering Center's River Analysis System (HEC-RAS) can be used in concert with HEC-GeoRAS to develop a dam failure model. HEC-GeoRAS is used to extract geometric information from a digital terrain model and then imported into HEC-RAS. Unsteady-flow simulation can be done using HEC-RAS. The two primary tasks in the hydraulic analysis of a dam breach are the prediction of the reservoir outflow hydrograph and the routing of that hydrograph through the downstream valley. There are many software's are available for analysis among them HEC-RAS software is considered as best available method for present study. Present work is concentrated around Nagarjuna sagar dam which is located at latitude 15.7542° N, longitude 80.8972° E and at an elevation is about 73m (240 feet) above the mean sea level. 2D Flow Simulation for upstream side of the Nagarjuna sagar dam. The distances between two reservoirs are around 101 kilometers. Latitude and Longitude are calculated for every 250 meters for upstream side catchment area (i.e. from Srisailam dam to Nagarjuna sagar dam..

Index Terms **– HEC-RAS,2D Flow simulation, Outflow hydrograph.**

I. INTRODUCTION

HEC-RAS is a computer program that models the hydraulics of water flow through natural rivers and other channels. The Hydrologic Engineering Centre (HEC) in Davis, California developed the River Analysis System (RAS) to aid hydraulic engineers in channel flow analysis and floodplain determination. The basic computational procedure of HEC-RAS for steady flow is based on the solution of the one-dimensional energy equation. Energy losses are evaluated by friction and contraction / expansion. The momentum equation may be used in situations where the water surface profile is rapidly varied. These situations include hydraulic jumps, hydraulics of bridges, and evaluating profiles at river confluences. For unsteady flow, HEC-RAS solves the full, dynamic, 1-D Saint Venant Equation using an implicit, finite difference method. HEC-RAS has merits, notably its support by the US Army Corps of Engineers, the future enhancements in progress, and its acceptance by many government agencies and private firms. It is in the public domain and peer-reviewed and available to download free of charge from HEC's web site. Various private companies are registered as official " vendors" and offer consulting services and add on software. Some also distribute the software in countries that are not permitted to access US Army web sites. However, the direct download from HEC includes extensive documentation, and scientists and engineers versed in hydraulic analysis should have little difficulty utilizing the software..

II. DATA COLLECTION

In order to achieve the objectives of the present work the latitude and longitude of the work area are noted i.e. Nagarjuna sagar dam which is located at latitude15.7542° N, longitude 80.8972° E and at an elevation is about 73m (240 feet)above the mean sea level..

Fig 1 Stretch from Srisailam reservoir to Nagarjuna Sagar reservoir

Fig 2 Image of taking latitude and Longitude

III. DATA FROM ARC-GIS

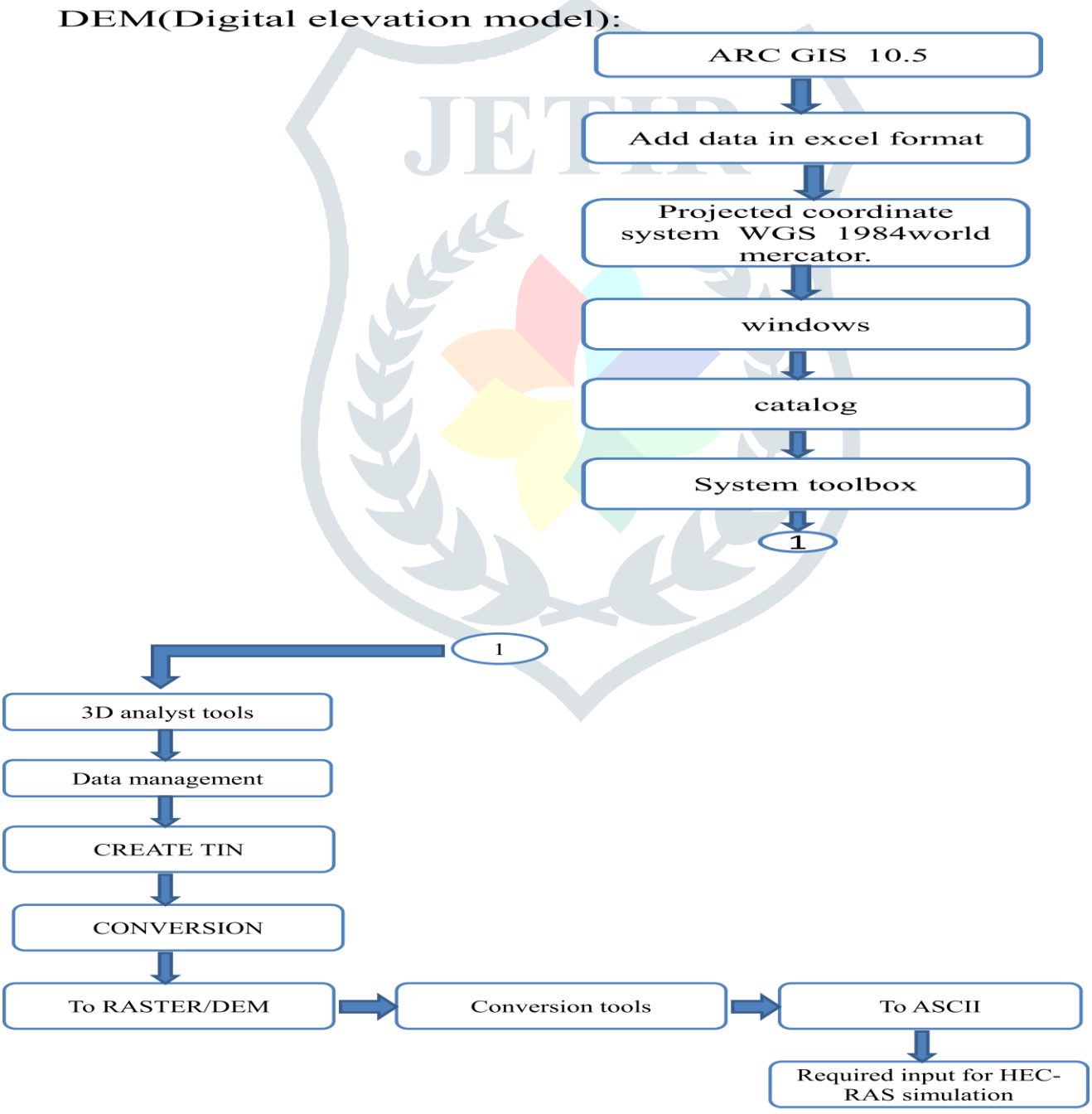

Fig 3 flow chart for creation of input file to HEC-RAS from ARC-GIS

Fig 4 DEM (Digital elevation model for flow stream of u/s of Nagarjuna sagar reservoir.)

IV. RESULTS AND DISCUSSION

2 D Flow simulation for the upstream side of the Nagarjuna sagar reservoir has been done successfully using HEC-RAS.

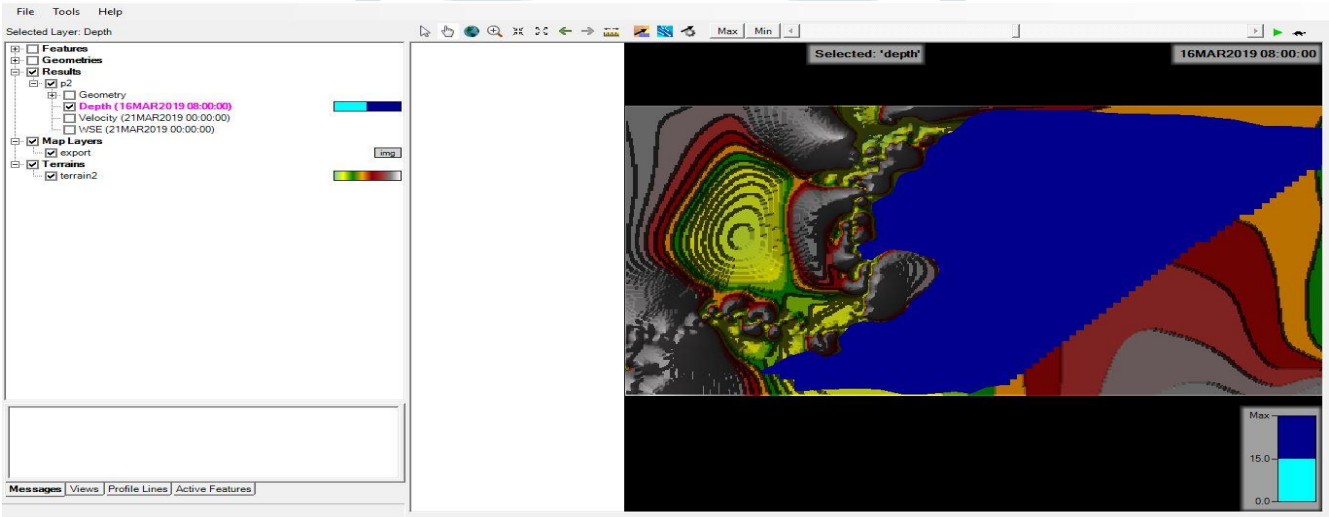

Fig 5 Depth variation along the u/s stride of Nagarjuna sagar reservoir in 2-D Flow simulation using HEC-RAS

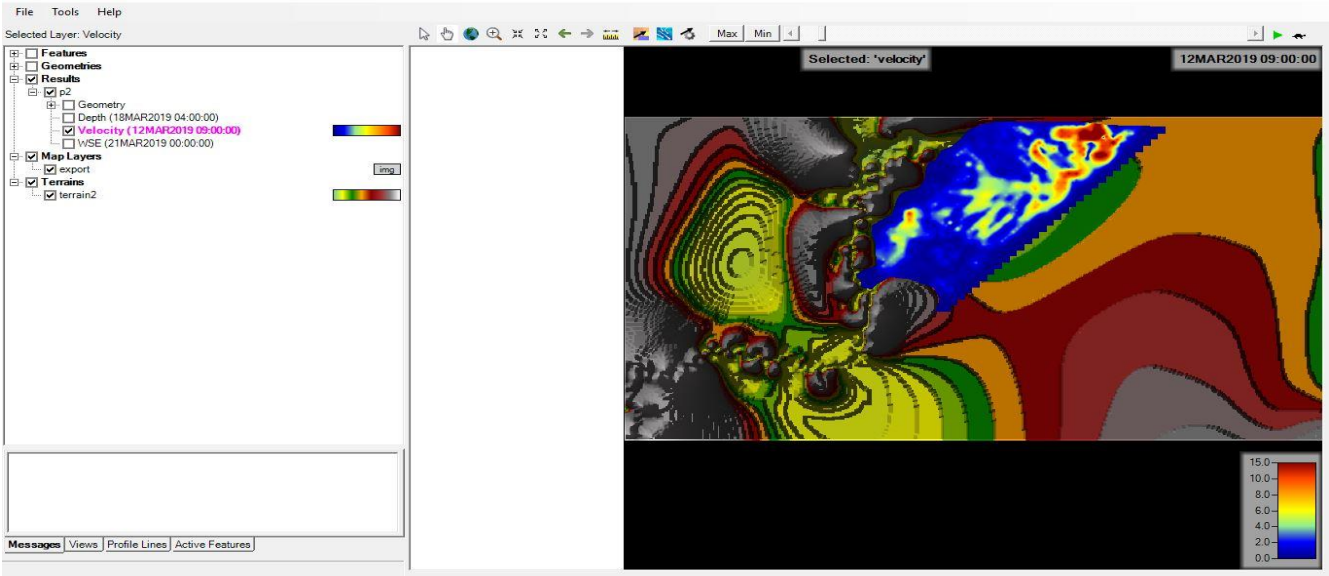

Fig 6 Velocity variation along the u/s stride of Nagarjuna sagar reservoir in 2-D Flow simulation using HEC-RAS

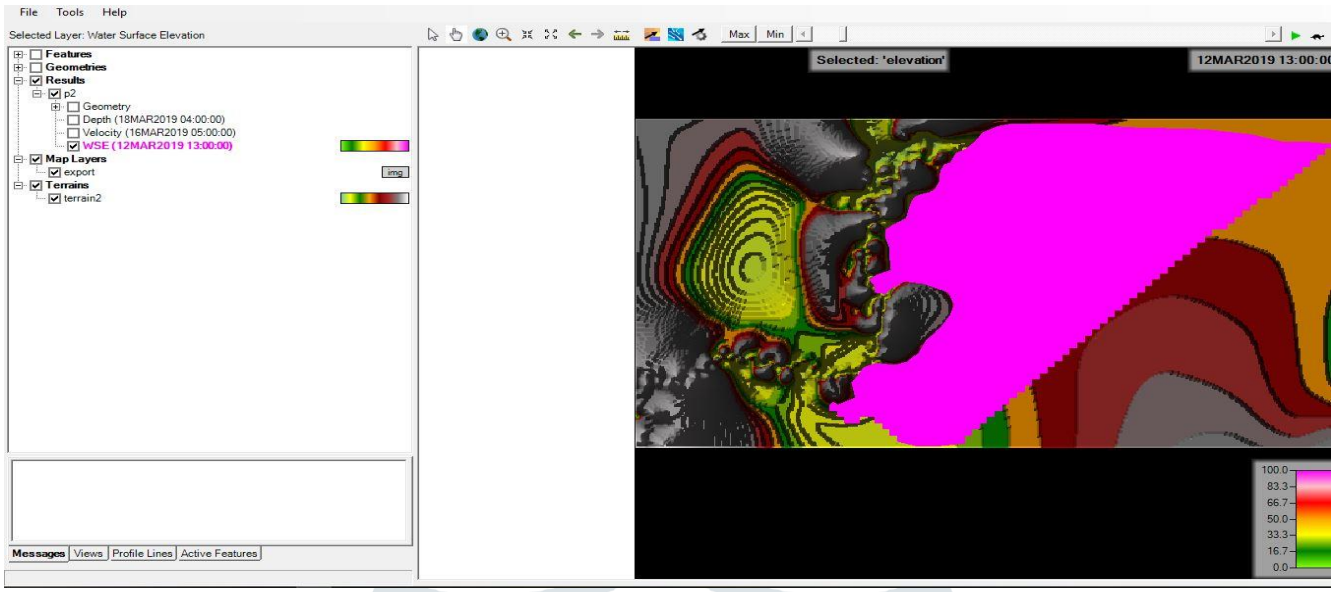

Fig 7 Water Surface Elevation variation along the u/s stride of Nagarjuna sagar reservoir in 2-D Flow simulation using HEC-RAS

V. CONCULSIONS

2 D Flow simulation for the upstream side of the Nagarjuna sagar reservoir has been done successfully using HEC-RAS. Maximum water surface Elevation is observed as 100m. Maximum flood velocity is observed as 15 m/s. Maximum depth of flood is estimated as greater than 15m. 2D flow simulation is done for approximated data. The efficiency of HEC-RAS has to be checked for real time data. Aerial extent is limited for the present work. Extended area to be taken into consideration when working with real time data.

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