APPENDIX A

ROG Alternative A Results Evaluation

Church Creek Basin Improvement

Rain on Grid Conceptual Alternatives Evaluation

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1 Introduction

DHI has been tasked to develop 2-Dimensional (2D) hydrodynamic rain on grid model which will be used to evaluate existing drainage conditions in Church Creek basin. In a rain on grid model, precipitation is applied to a representative topography; the 2D model routes the precipitation volume based on the topography and energy grade lines. In this manner, a rain on grid model is useful for developing an understanding of drainage patterns, areas of channelization for flows, areas of ponding and prolonged inundation, and lastly an overall depiction of the drainage patterns and watershed response to large rainfall events.

The Baseline condition model was developed using the 2-Dimensional Flexible Mesh model, MIKE 21 FM. The Baseline model was built based on a 10-foot x 10-foot raster representing the existing topography of the drainage area. The bare earth topography was modified for use in the rain on grid model to include using a simplified channel and bridge crossing approach to provide drainage pathways and an overall understanding of drainage conditions during extreme rainfall events. The goal of this development is to support and guide detailed modeling and the evaluation of design approaches for flood management. The Baseline model is also used to provide a preliminary assessment of drainage improvement alternatives.

In addition to the Baseline scenario of existing conditions, an additional alternative conditions rain on grid model was developed in order to evaluate the impacts of a drainage improvement approach (Alternative A). Alternative A considers reopening multiple historic slough channels thus diverting drainage waters away from existing developed areas.

In the Scenario A model, the Existing Conditions MIKE 21 FM model was updated to mimic proposed design condition by opening outlets at profiles 54, 64, 11 and 41 as shown in Figure 1 Computational Profiles Location. In addition channels connecting those outlets were adjusted to provide better conveyance and smooth hydraulic connection. Proposed drainage improvements were based on drawings and communication provided by Weston & Sampson. Alternative A results are provided to evaluate and support future drainage improvement and prove of conceptual approach.

Baseline and Alternative A models were compared for 100yr 24hr SCS III curve rainfall event provided by Weston & Samson.

2 Result analysis for design rainfall event with proposed improvements. (Alternative A).

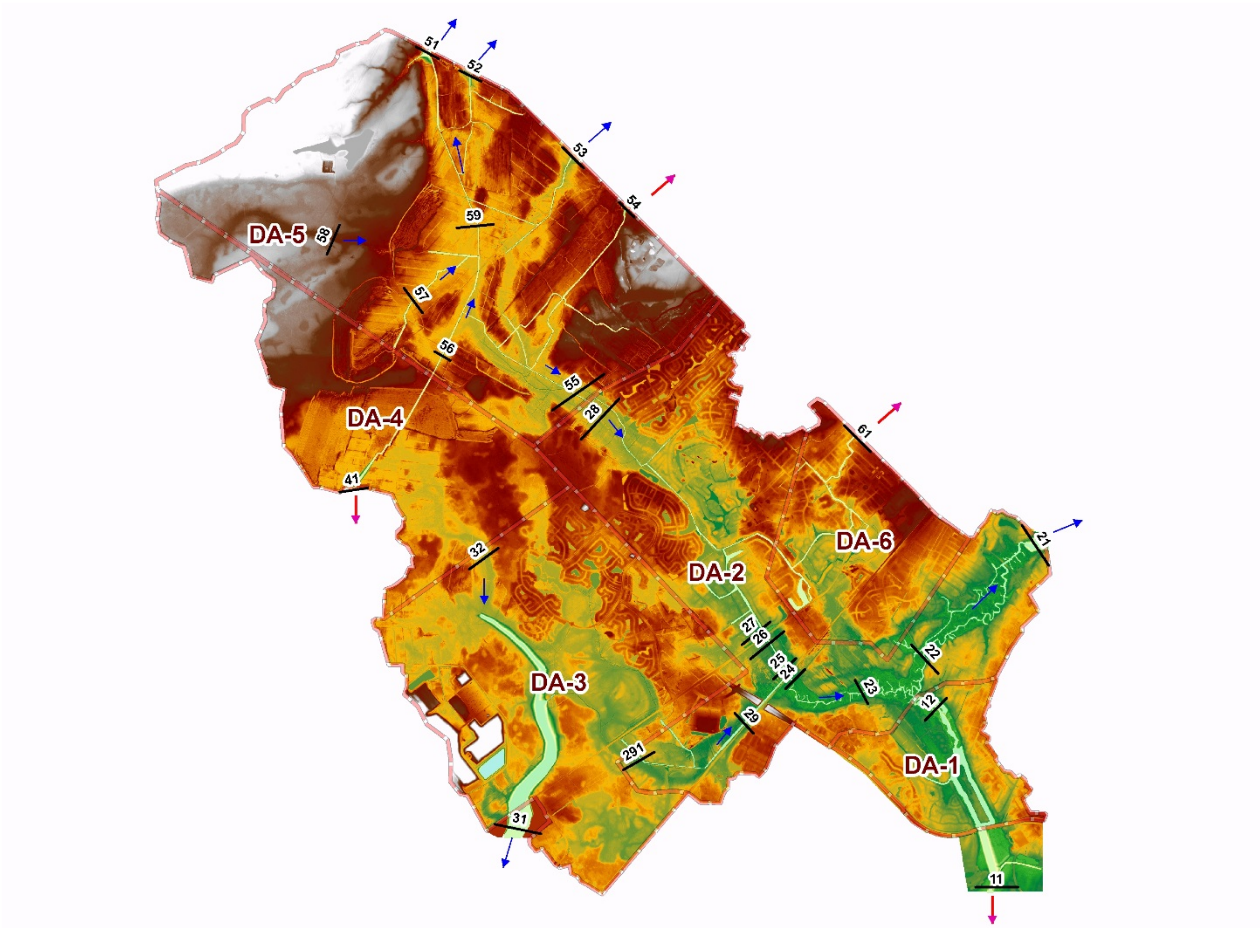

Figure 1 Computational Profiles Location

In order to provide overall accumulated volume changes in the basins multiple computational profiles were implemented. Due to 2D modeling approach profiles are used to calculate hydraulic parameters in specific location which covers larger number of computational points. The computational profile aggregates fluxes in P and Q flow direction (grid defined orthogonal directions) into timeseries of discharges and volumes.

The computational profiles were named with sequentially based DA-N basins number (see Figure 1 Computational Profiles Location). In addition approximate flow patterns for the Baseline alternative is shown with blue arrows.

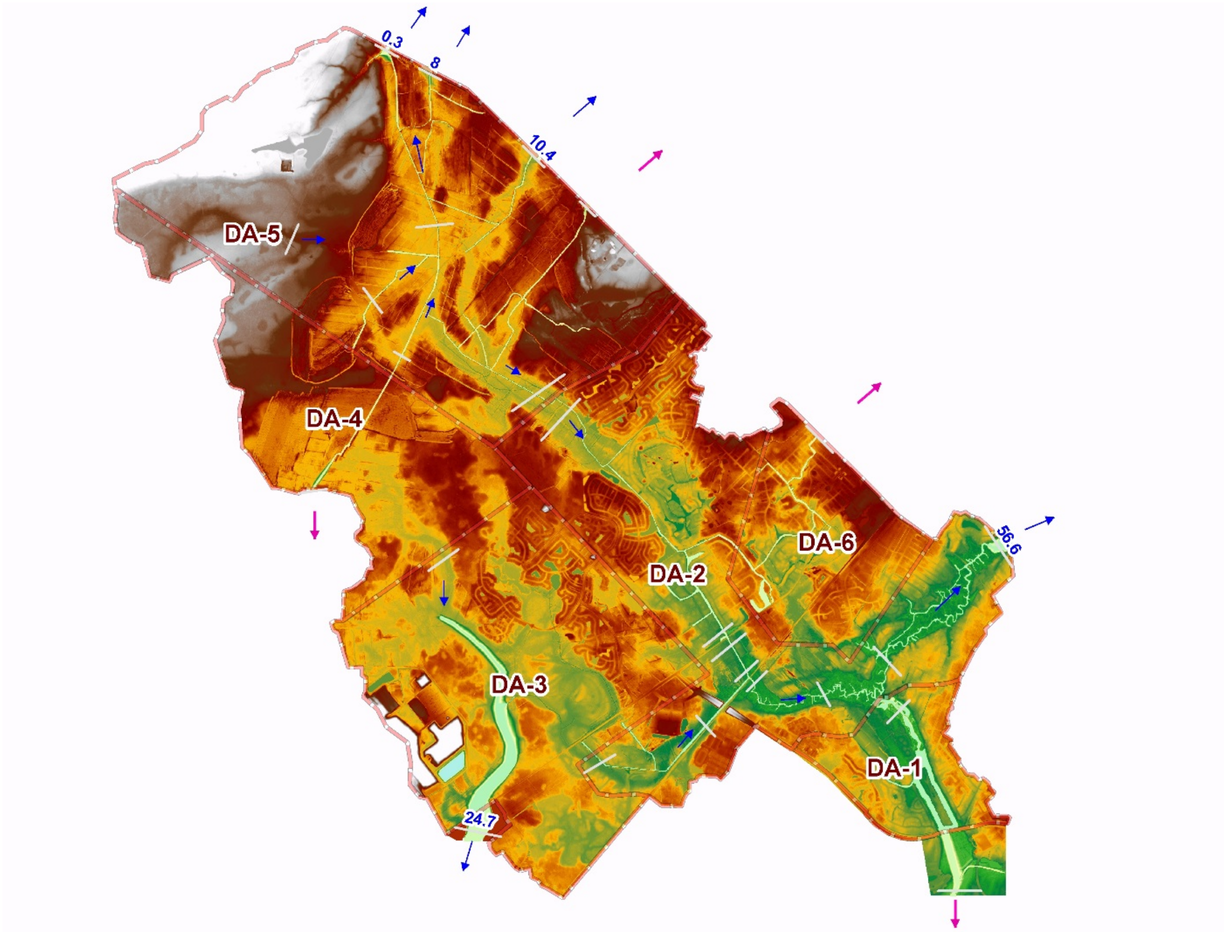

Figure 2 Baseline scenario for 100yr 24hr rainfall event. The numbers (blue) represents percentage of accumulated volume outflow from the basin.

Baseline model analysis shows that the dominant outflow volume from the system is in the DA-2 sub basin (profile 21) where more than 50% of the rainfall volume exits the area.

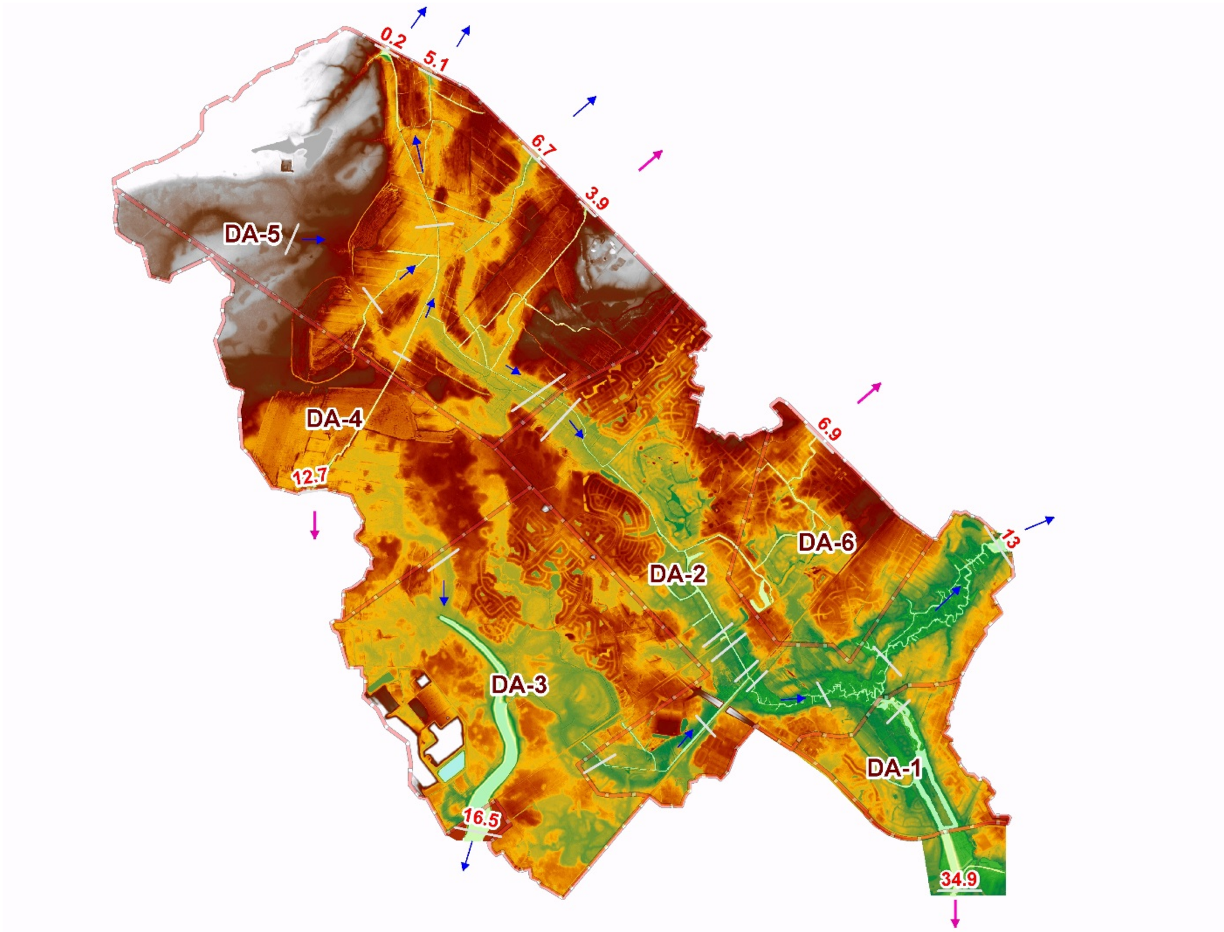

Figure 3 Result for Alternative A - 100yr 24hr rainfall event. The numbers (red) represents percentage of accumulated volume outflow from the basin

Alternative A model analysis shows that the dominant outflow volume from the system is DA-2 sub basin (profile 21) was significantly decreased to 13% of the rainfall volume. Overall outflow volume balance was achieved by significant increase outflows in DA-1 (34.9%), DA-4 (12.7%), DA-6 (6.9%).

In addition to providing the balance distribution at the boundaries, an overview of accumulated flow for all computational profiles is provided in Figure 6 Differences in Outflow Volumes (Million Cubic Feet) between Baseline and Alternative A. Positive numbers represents an increase, negative a decrease of the cumulative outflow volumes.Figure 6. A negative number represents a decrease in the accumulated volume flow. There are no changes in the flow patterns and overall direction except for DA-4 and DA-1 areas. The proposed channels will change the flow direction from NNE to SSW and from N to S for DA-4 and DA-1 respectively.

It should be emphasized that the results are based only on rainfall event simulation constant water level at outlets and single 24 hr rainfall event without considering storm surge.

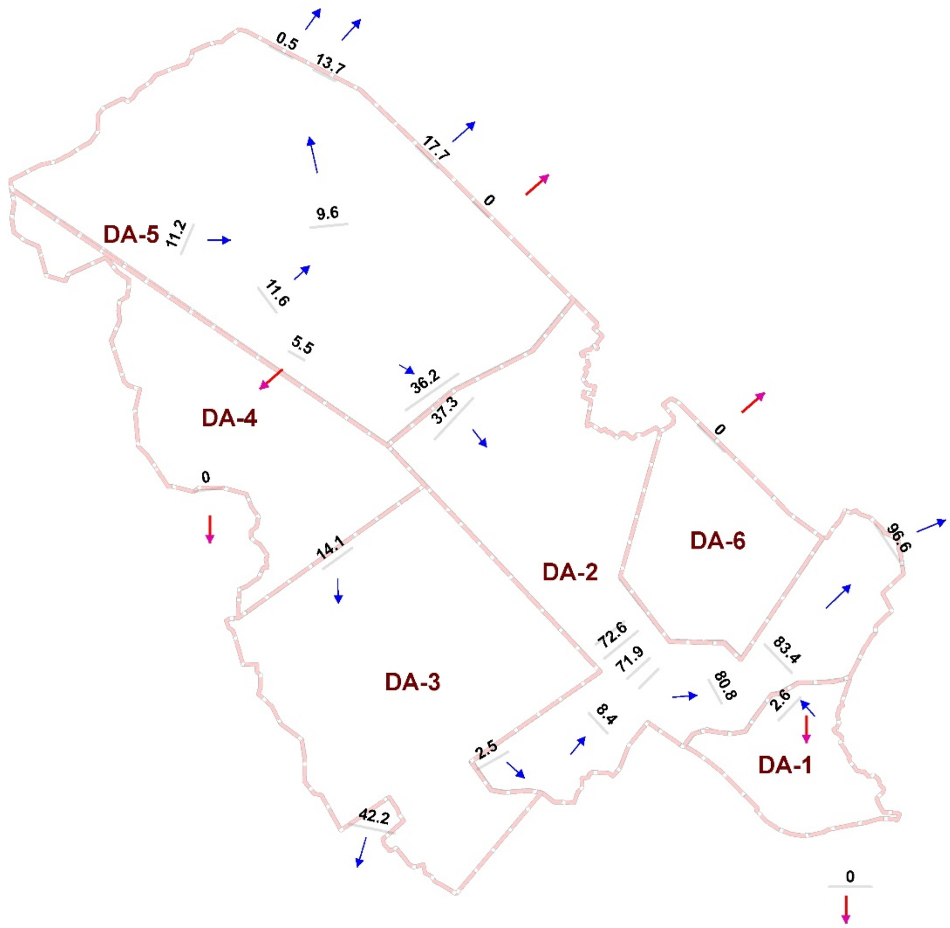

Figure 4 Outflow Volumes (Million Cubic Feet over 24h period) for Baseline alternative. (Blue arrows represents flow directions)

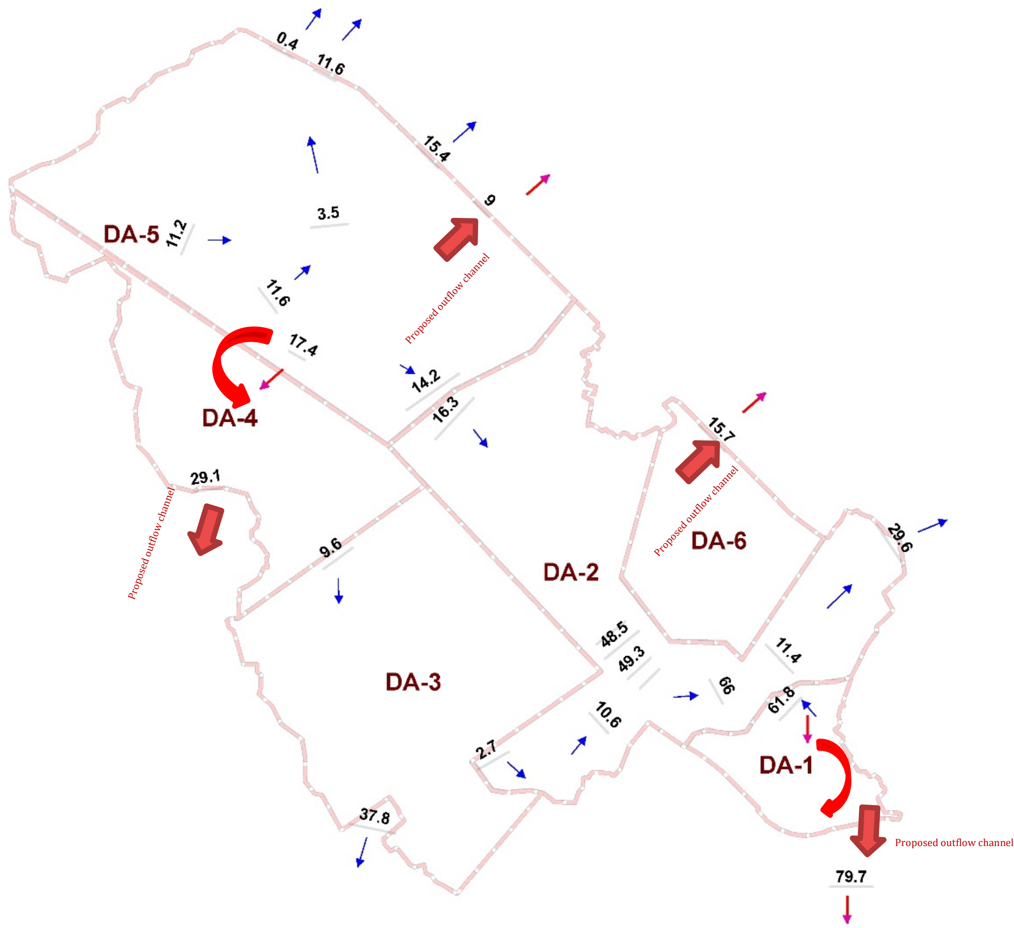

Figure 5 Outflow Volumes (Million Cubic Feet over 24h period) for Alternative A. (Blue arrows represents flow directions for baseline and red arrows potential changes for alternative A)

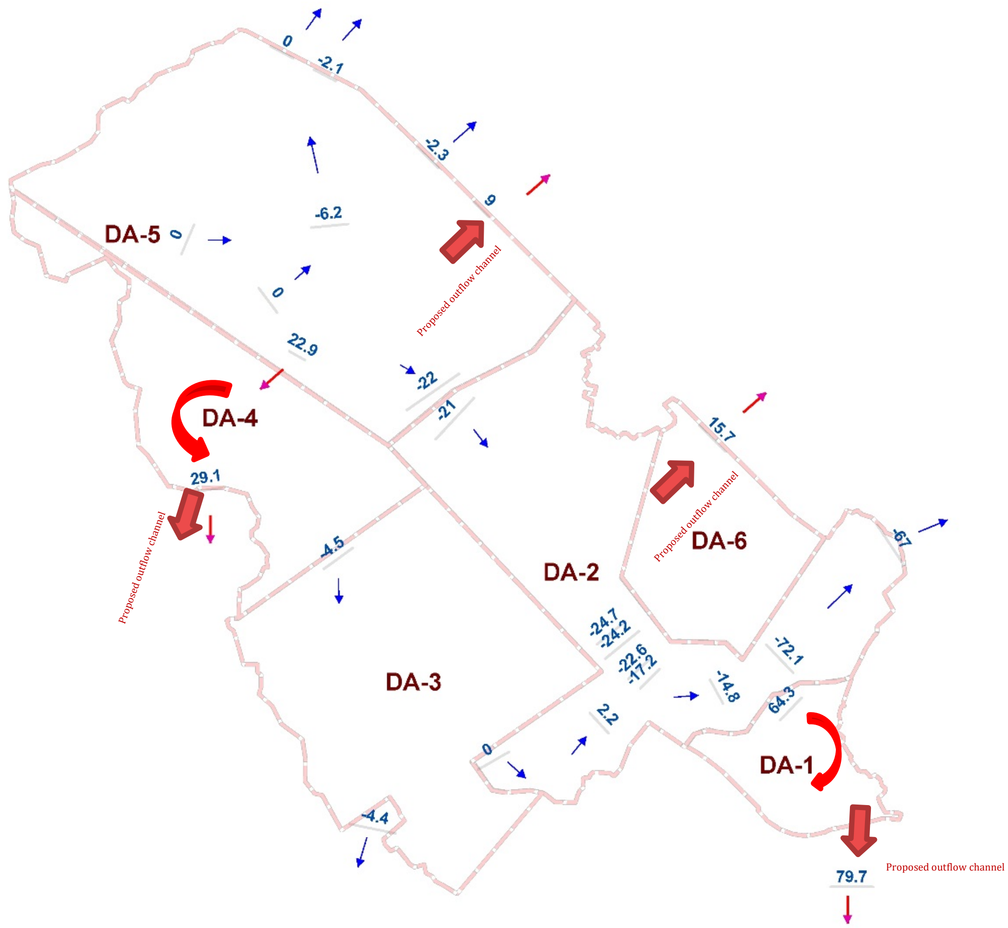

Figure 6 Differences in Outflow Volumes (Million Cubic Feet) between Baseline and Alternative A. Positive numbers represents an increase, negative a decrease of the cumulative outflow volumes.