Section 3
Franklin IWRP Framework

The development of the Franklin IWRP has followed a stakeholder-driven process for defining the objectives, objective weights, and performance measures used to rank and compare alternatives. During the workshops discussed in Section 2 the stakeholder advisory group defined nine objectives, assigned weights to the objectives, and developed a set of one to five performance measures by which to gauge the achievement of each objective. Project options (or options) were derived from existing plans, reports, and stakeholder input and represent a consolidated list of all projects that could potentially be included in the plan. During a workshop, stakeholders worked in groups to formulate alternatives by grouping together options aiming to meet the five most heavily weighted objectives. The following sections describe the process of developing the framework of the IWRP process – from brainstorming objectives to grouping options into alternatives.

3.1 Stakeholders

Stakeholder participation in the IWRP process is critical to the success of the project. Stakeholder concerns play a key role in the IWRP development process, particularly in regards to public agencies. The involvement of stakeholders during the decision-making process of the IWRP allows for open, fair, and accepted solutions to issues.

The City of Franklin is governed by an elected Board of Mayor and Aldermen (BOMA) made up of nine people—the mayor and eight aldermen. BOMA selected the IWRP process as the most effective and beneficial method of developing a resource plan for the City of Franklin's water systems. BOMA is ultimately the deciding body for plan selection, which is the objective of Phase II of the IWRP. The decision process is illustrated in **Figure 3-1** and includes three levels of stakeholder input: steering committee, stakeholder advisory group, and public forums.

The steering committee consists of a select group of knowledgeable stakeholders who provide guidance on scope and process and help distill overall stakeholder recommendations to BOMA. The stakeholder advisory group is a larger group of individuals who represent various parties with interest in Franklin's water resources decisions (e.g. state regulators, watershed advocates, citizens, and water utilities). Public forums are the venue by which the general public can provide input to the planning process and learn about the suggested solutions.

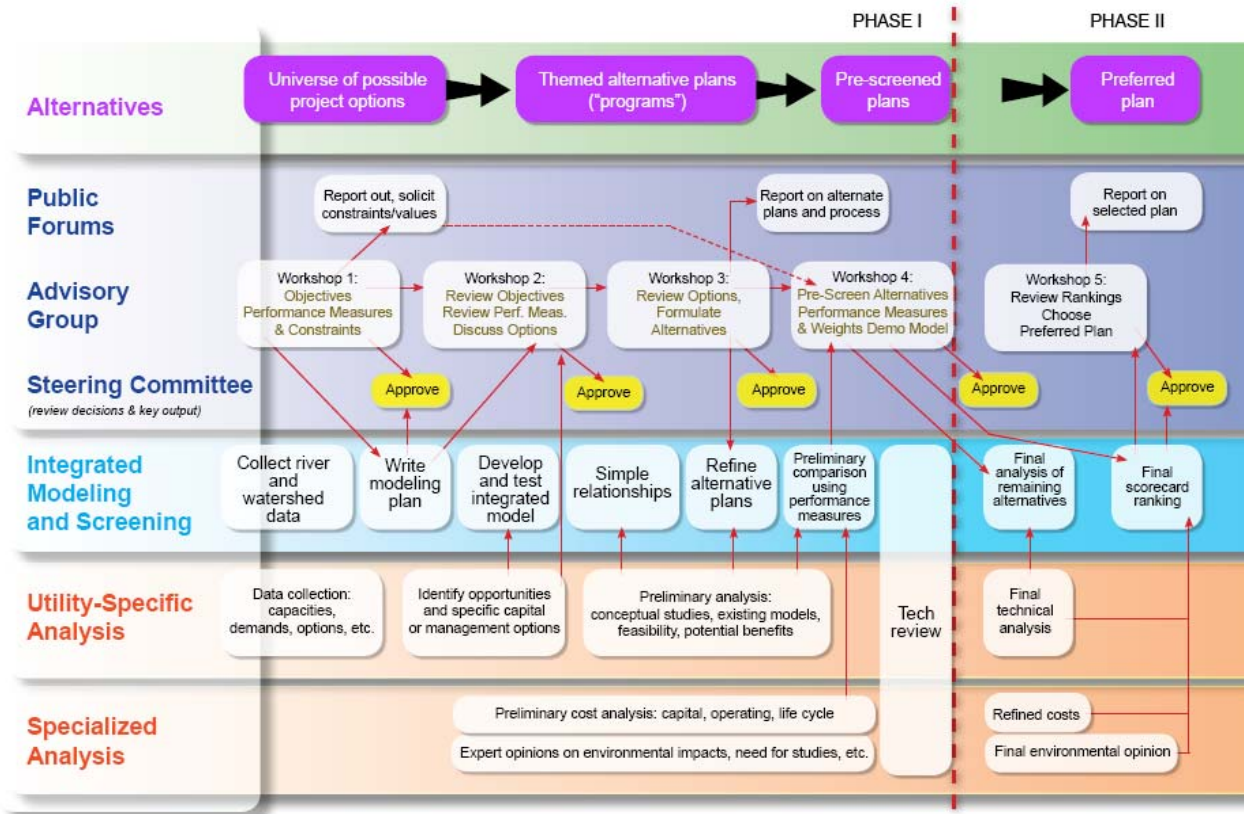


Figure 3-1
Franklin IWRP Stakeholder Involvement Workflow

The levels of stakeholder input within the IWRP allow BOMA and the City of Franklin to feel confident that the alternative sets developed so far and, ultimately, the approved plan have undergone rigorous evaluation by all parties with vested interest. The final plan will be developed during and through a series of steering committee meetings, stakeholder advisory group workshops and public forums.

3.1.1 Steering Committee

The steering committee was established to provide guidance on scope and process, answer questions and offer suggestions to stakeholders, and help distill information and recommendations to BOMA. The steering committee members have a high degree of knowledge of the water resources systems and/or the City of Franklin. **Table 3-1** lists the members of the steering committee and their affiliations.

Table 3-1
Franklin IWRP Steering Committee

Name	Affiliation
Eric Gardner	City of Franklin, Engineering Director
Mark Hilty	City of Franklin, Water Management Director
Dr. Eugene LeBoeuf	Vanderbilt University, Franklin citizen
Dr. Ken Moore	BOMA
David Parker	City of Franklin, City Engineer
Eric Stuckey	City of Franklin, City Administrator

3.1.2 Stakeholder Advisory Group

The stakeholder advisory group includes representatives of organizations with a vested interest in the projects planned for the City of Franklin. The types of organizations included are watershed nonprofits, regulatory agencies, private or public utilities, city officials, and public representatives. The input from these types of organizations is important, because it is only with their support that the IWRP is accepted and implemented.

The responsibilities of the stakeholder advisory group are to participate in planning workshops to give input and to make informed decisions and recommendations to the steering committee. Each stakeholder advisory group member brings input from the stakeholder group that he or she represents, including the public. **Table 3-2** lists the members of the stakeholder advisory group.

3.1.3 Public Citizens

The citizens of the City of Franklin are the largest and most important group affected by the decisions made during the IWRP. The public is invited to participate in the IWRP process by attending public forums, contacting a member of the stakeholder advisory group, or directly contacting the steering committee and consultants.

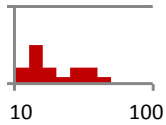
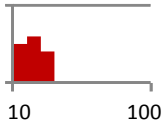
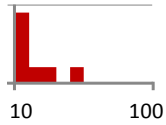
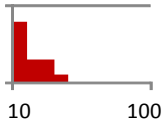
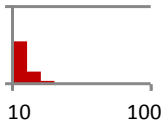
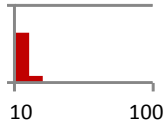
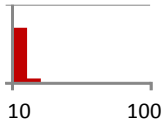
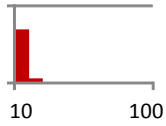
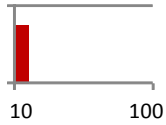
3.2 Defining and Weighting Objectives

The IWRP project objectives were developed by the stakeholder advisory group during Workshop 1. During this workshop, stakeholders identified nine overarching objectives for the IWRP, and agreed that they represented the collective interests of all participating groups. These objectives are described in **Table 3-3**. Each stakeholder was asked to assign a relative importance (weight) to each objective by distributing 100 total points among the nine objectives. This was accomplished outside of the workshops so that individual stakeholders could consult with their constituents on the weights that would be most representative of their interests. For each objective, the average of all stakeholder weights was used to represent the relative importance of that objective to the group as a whole. In this way, all nine objectives were ranked from most to least important, and all were applied commensurately in the subsequent comparison of alternatives. Table 3-3 also lists the minimum and maximum values given to each objective by stakeholders and the distribution of responses.

Table 3-2
Franklin IWRP Stakeholder Advisory Group

Name	Affiliation
Dorie Bolze	Harpeth River Watershed Association
Dan Crunk	Community Representative
Kristi Earwood	Attorney for Williamson County
Scott Gain	USGS
Tim Ham	Mallory Valley
Doug Hausken	Cumberland River Compact
Dr. Deedee Kathman	TDOT, Environmental Division
Lee Keck	TDEC
Dan Klatt	Community Representative
Greg Langeliers	Thompson Station
Roger Lindsey	Franklin Planning Commission
John McClurkan	TN Department of Agriculture, Water Resources
Tom Puckett	HB&TS
Howard Smithson	Milcroften
Rob Todd	TWRA
Dr. Sherry Wang	TDEC
Bobby Worthington	HVUD

Table 3-3
City of Franklin IWRP Objectives and Weights

Objectives		Weights			
Name	Description	Min	Max	Average	Histogram
Reliability	Meet current and future demands for water and wastewater reliably	0	70	31.1	
Efficiency	Maximize efficiency of water use and value of water resources	5	25	15.5	
Water Quality & Ecological Health	Improve water quality and ecological health of Harpeth River and watershed	0	50	13.5	
Service at a Reasonable Cost	Provide excellent level of water/wastewater utility services at reasonable cost	0	40	13.2	
Safety & Security	Provide safety and security of water resources systems	0	25	8.3	
Regional Acceptance	Achieve regional acceptance	0	15	5.7	
Sustainable Biosolids Management	Achieve sustainable biosolids management	0	15	4.7	
Improved River Access	Provide improved access and aesthetics of Harpeth River	0	15	4.5	
Carbon Footprint	Minimize carbon footprint of water resources operations	0	10	3.5	

Histograms (graphs in the last column) represent the number of respondents at each weight and are intended to illustrate whether the group's values were generally unified or dispersed. In all the graphs, the horizontal axis is the weight of the objective (in 10 point intervals from 0-10 to 90-100), and the vertical axis is the number of respondents at each weight.

Table 3-4
Franklin IWRP Performance Measures

Objectives	Weight	Performance Measures	Units
Reliability	31.1	Percent of time all demands met	% time (all days)
		Average magnitude of deficits (all uses)	volume, MG
		Volume of WW capacity surplus or shortfall	MGD
		Supply redundancy	% volume
Efficiency	15.5	Volume of stormwater put to beneficial use	MGD (all days)
		Percent of total reuse demand satisfied	% volume
		Percent of demand reduction	% volume
		Reduction in inflow and infiltration	qualitative
		Percent reduction in unaccounted for water	% volume
Water Quality & Ecological Restoration	13.5	Frequency of low flow < September median	% time (all days)
		Average summer BOD load (lb/day)	LB/day (summer only)
		Average summer nitrogen load (lb/day)	LB/day (summer only)
		Ecological indicators	qualitative
		Negative impacts of stormwater reduced	qualitative
Service at a Reasonable Cost	13.2	Life-cycle cost of projects and policies	dollars
		Combined change in water and sewer rates	qualitative
		Meet secondary drinking water standards	qualitative
Safety & Security	8.3	Percent of total wastewater on septic	% volume
		Change in 100-year flood elevation	qualitative
		Vulnerability of infrastructure & facilities	qualitative
		Emerging water quality concerns	qualitative
Achieve Regional Acceptance	5.7	Extent of regional focus	qualitative
		Likelihood of public acceptance	qualitative
Sustainable Biosolids Management	4.7	Biosolids handled sustainably	qualitative
Improved Access & Aesthetics	4.5	Percent of stream flow that is WWTP effluent	% volume (Sept. only)
		Extent of bank stabilization	qualitative
		Erosion potential	qualitative
		Public accessibility	qualitative
Carbon Footprint	3.5	Average energy requirements (kWh/day)	average kWh/day

3.3 Defining Performance Measures

Performance measures are quantitative and qualitative ways in which progress toward each of the nine objectives could be measured. Performance measures for the Franklin IWRP were developed during Workshop 2 and refined throughout Phase I by the stakeholder advisory group and steering committee. Each performance measure supports one of the nine objectives as shown in Table 3-4 and gives a means

for evaluating the effectiveness of an alternative in meeting an objective. Some of these metrics were quantitative, and could rely on numbers derived from engineering or cost analysis. Others were qualitative, and relied on the expert judgment and consensus of the steering committee on the relative ability of alternatives to satisfy the objectives.

3.4 Options and Alternatives

A list of potential project options for each system, including water, wastewater, stormwater, reclaimed water, and the Harpeth River, were provided to the stakeholders. These options were compiled from existing studies and plans and did not exclude any feasible project option from consideration. Stakeholders were asked to review these project options and provide additional ideas or other feedback.

During Workshop 3, stakeholders designed alternatives around the five most heavily weighted objectives. The process consisted of selecting options determined to best meet each of the objectives individually, and each group of options resulted in an alternative named for that objective. Table 3-3 lists the alternatives and associated options described below.

- **Water Quality and Ecological Health–** The focus of this alternative is improving the water quality and ecological health of the Harpeth River and includes project options specifically aimed at that goal. This alternative is hereafter referred to as Water Quality.

- **Cost –** This alternative is designed to provide a level of services for water resources at a reasonable cost and includes project options that seem to meet the needs of the City at the lowest estimated cost.

- **Efficiency –** The options selected for this alternative are intended to maximize the efficiency of water use and emphasize the value of water resources.

- **Reliability –** This alternative includes options designed to reliably meet current and future demands for water and wastewater handling.

- **Safety and Security –** Options included in this alternative were selected with the intent to provide safety and security of water resources systems.

During Workshop 4, stakeholders reviewed the comparative study of the five original alternatives; that is, the composite value of performance measures, weighted by the importance of the objective linked to each performance measure (see Section 3.6 for a detailed explanation of this process). This was accomplished with the use of an integrated system simulation model (discussed in Section 3.5 and Section 4), which provided additional information on the broad impacts of various options. The group then identified tradeoffs between the themed alternatives, as well as options that appeared to perform well by addressing more than one objective. The alternatives were regrouped into hybrid alternatives, which effectively mixed the best of the best to yield balanced alternatives aimed not at one objective, but at as many as possible.

The workshop concluded with a consensus that four remaining hybrid alternatives be carried forward to Phase II for more detailed technical and economic analysis.

3.5 Integrated System Model

An integrated system model was developed to simulate the stakeholder-defined alternatives with project options in each of the water utilities. This model provides output to stakeholders in the context of their own stated objectives. The software used for analysis for the IWRP is STELLA. More information on STELLA, as well as a trial version of the software, may be found at the following website:

http://www.iseesystems.com/softwares/Education/StellaSoftware.aspx .

STELLA is a dynamic and graphical tool used to simulate interactions between and within subsystems that are part of a larger, interconnected system. It is frequently used in environmental engineering venues to better understand the implications of decisions across a broad array of social and environmental sectors. The City's water resources systems—the Harpeth River, water supply, wastewater, reclaimed water, and stormwater—were modeled with the software STELLA. The model is a representation of the interconnections between the major water resources systems and includes planning-level calculations of flow, pollutant loads, energy requirements, and operational costs. A complete explanation of the system model development, demand projections, and assumptions is provided in Section 4.

3.6 Scorecard Analysis

The performance measures listed in Table 3-4 were scored for each alternative by using either direct model output for quantifiable performance measures or qualitative scores developed by the steering committee. The software program, Criterion Decision Plus (CDP), was used to perform the scorecard analysis, which involves standardizing the raw performance measure scores, applying the objective weights as determined by the stakeholder advisory group, and ranking the alternatives based on the aggregate scores across all objectives. CDP is a visual model with multiple ways of displaying results. CDP was selected as the decision modeling tool because of its sophistication, ease of understanding and use, and its ability to conduct sensitivity analyses on all of the various values input to the model, such as criteria weights, performance, and satisfaction levels. More information on CDP can we found at the website www.infoharvest.com/ihroot/index.asp.

Goals, objectives, performance measures, and weights are input into CDP. In order to rank alternatives (groups of options), raw portfolio scores for each performance measure are also input to CDP. Each score is standardized on a linear scale from 0 to 1, with the best possible score translating to 1 and the worst possible score translating to 0. In this way, the various units in which the performance measures are quantified are eliminated, and it is possible to compare all scores. **Figure 3-2** shows an example of how the cost of an alternative is translated into a unit-less score.

A composite score for each objective was determined based on the sum of scores of its performance measures, and this score was multiplied by the weight of that objective as determined by the stakeholder involvement process (see Table 3-3). These values were then summed for comparison across all alternatives.

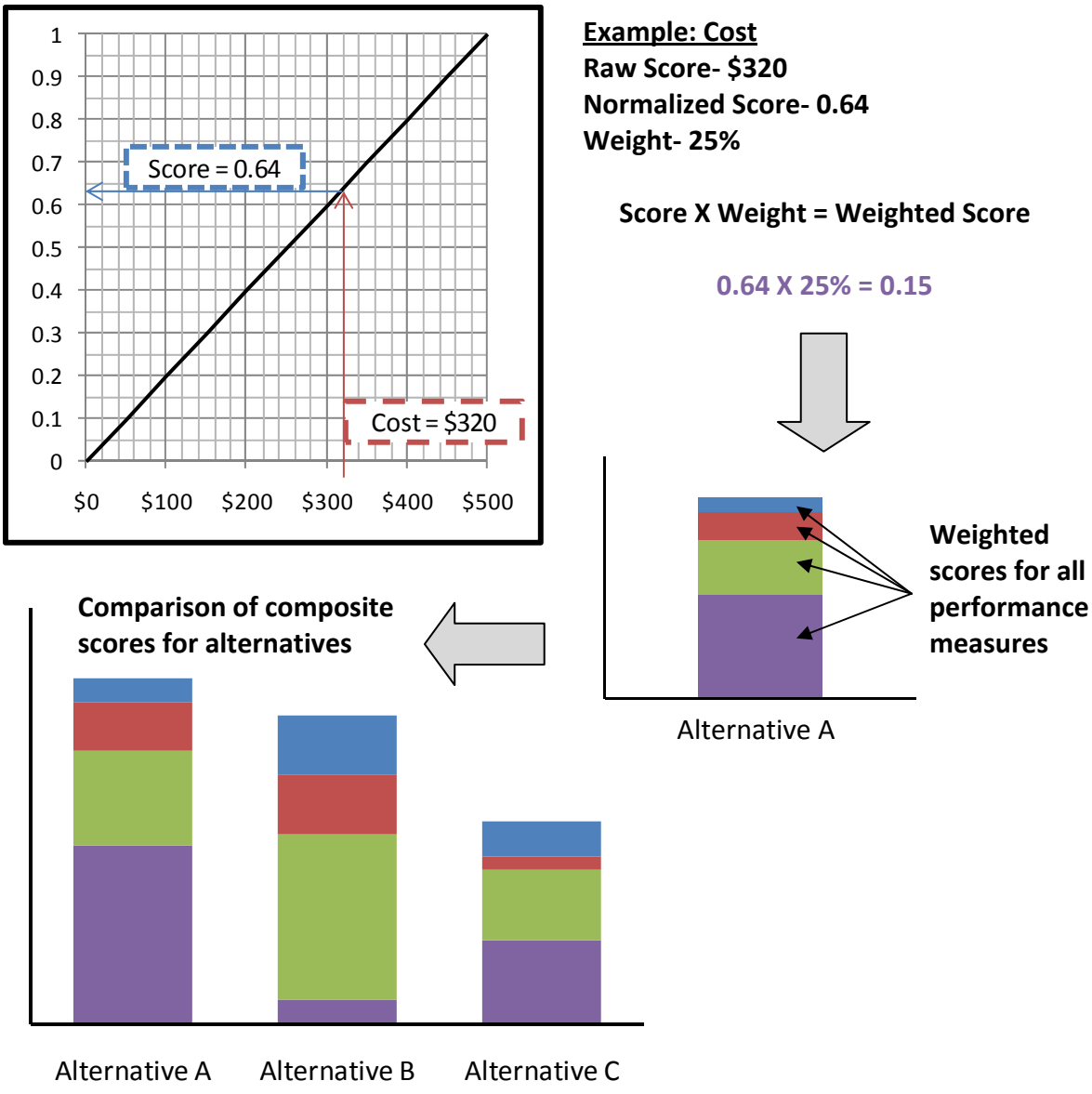


Figure 3-2
Example of Normalizing and Weighting Performance Measure Scores