REGIONAL VS. ON-SITE FACILITIES

This paper attempts to objectively answer some of the frequently asked questions concerning the performance of regional stormwater management facilities as compared with on-site detention ponds. The paper also explains the reasoning behind the types of pollutant removal efficiencies attributed to regional facilities in the Fairfax County Public Facilities Manual (PFM)

1. *Reasons why regional ponds are given higher Phosphorus (P) removal efficiencies in the PFM*

- On-site ponds typically treat only a portion of the total first flush runoff volume that is controlled by the pond. This is because on-site-pond best management practice (BMP) volumes are computed based on site area and site imperviousness and not on the total watershed area and imperviousness draining to the pond. This results in a reduction of P removal efficiencies.

- The likelihood and ease of maintenance: T. R. Schueler (1987… Controlling Urban Runoff) points out that the small BMP orifices in a typical on-site extended dry pond is extremely susceptible to clogging and presents a severe maintenance problem.

- The ability to include additional pollution removal features (e.g. e.g. micro pools, wetland marches, aquatic vegetation around benches etc) into on-site pond designs is adversely impacted by space constraints. A lack of space generally prevents these features from being incorporated in on-site facilities. This is not an issue with regional facilities.

- The following references show that extended dry facilities are not practical for watershed (or site areas) areas <10 acres.

  Adams, L.W., Dove, L. E., Leedy, D.L., and Franklyn T., 1983, "Methods of Stormwater Control and Wildlife Enhancement: Analysis and Evaluation", Urban Wildlife Research Center, Columbia M.D. 200 pp;

  Schueler, T. R., Kumble, P.A., and Heraty, M.A., 1992, "A Current Assessment of Urban BMPs", Department of Environmental Programs, Metropolitan Washington Council of Governments, 777 North Capitol Street, Suite 300, Washington, DC 20002

- The following references supported by data contend that the random placement of stormwater detention facilities in a watershed may result in little or no reductions in peak flows in downstream sections and may even aggravate flood hazards. These studies further conclude that regional SWM facilities must be strategically located within a watershed in order to achieve significant control of the flows in downstream areas.

  Bonucelli et al., (1982); "Urban Runoff Management in a Multijurisdictional Watershed"

Traver & Chadderton, 1983 “Downstream Effects of SW Detention Basins.”

Duru, 1983 “On-site Detention: A Stormwater Management or Mismanagement Technique.”

2. *Wet Detention Facilities*

- For wet facilities, Schueler (1992) shows that the pollutant removal efficiency improves with retention volume in general. Based on data provided by the NURP studies Schueler showed that significant pollutant removal efficiencies are achieved when the wet detention volume is 4 times the runoff volume of the mean storm. This guideline is seldom adhered to by on-site facilities.

- In “The Basis of Design of Wet Detention” J P. Hartigan showed that pollutant removal efficiency increases with residence time. Residence time of Regional facilities are invariably larger than that of on-site facilities.

- The NURP study shows a direct relationship between residence time and Pollutant removal efficiency.

- W.W. Walker Jr., in “Phosphorus Removal by Urban Runoff Detention” Basins, Lake and Reservoir Management, 1987, provided data to support the direct relationship between residence time and removal efficiency.

3. *Other issues*

- Note: Adams et al., 1984, determined that while most homeowners do not consider dry ponds to be a safety hazard many complain about mosquitoes and other nuisance problems.

(West Nile Virus –bigger risk with onsite extended dry facilities)

Pollutant Removal Capability of Dry On-Site, Dry Regional and Wet Regional Ponds (%)

From: "A Current Assessment of Urban Best Management Practices"
Prepared by: Metropolitan Washington Council of Government

NOTE: The table below provides summary data on the pollutant removal capabilities of stormwater ponds. Each study differs with respect to pond design, number of storms monitored, pollutant removal calculation techniques, and monitoring techniques, so comparisons between studies may not be appropriate.

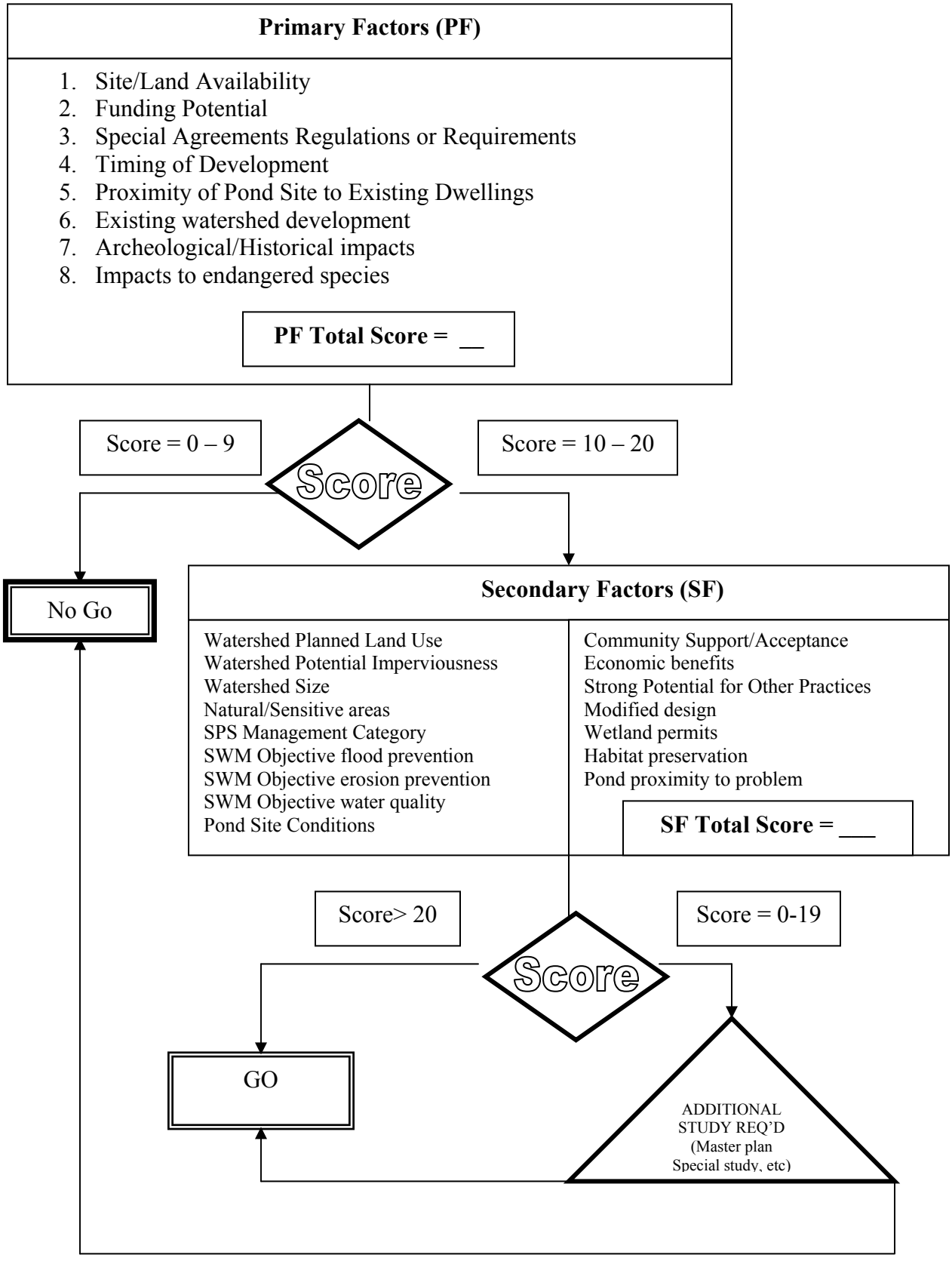
Ponds		DA	TSS	TP	SP	TN	NO3	COD	Pb	Zn
Dry Pond	VA	11.4	29	40		25		17	39	24
	TX	28.0	30	18		35	52	22	29	-38
	MD	16.8	87	26	-12		-10			
	MD	34	70	13		24		27	62	57
	KS	12.3	3.0	19	0		20	16	66	65
Dry Regional Pond	VA	***88.0***	14	20	-6	10	9	-10		-10
Wet Regional Ponds	MN	315	90	61	11	41	10		73	
	MN	608	91	78		85		90	90	
	MN	725	85	48	13	30	24		67	
	WI	238	90	65	70			70	70	65
	TX	381	54	46		39	45	41	76	69
	ONT	860	82	69						
	FL	122	64	60	80	15	80			
	ONT	395	98	79		54				

Regional: Drainage area (DA) approximately 100 acres or more

TSS: Total Suspended Solids
TP: Total Phosphorous
SP: Soluble Phosphorous
TN: Total Nitrogen
NO3: Nitrate
COD: Chemical Oxygen Demand
Pb: Lead
Zn: Zinc

REGIONAL POND INTERIM DECISION MATRIX

Draft



REGIONAL POND ASSESSMENT WORKSHEET

Primary Factors	Score
Site/Land Availability	
Funding Potential	
Special agreements, regulations and requirements	
Timing of development	
Proximity to existing dwellings	
Existing watershed development level	
Archeological/Historical Impacts	
Impacts to endangered species	
TOTALS	

Abbreviations and Definitions

Apts. - Apartments

Comm. - Commercial

env. - environment

LDSS - Low density single family subdivision

SPS - Stream Protection Strategy

SWM - Stormwater management

WPA - Watershed protection area

WRALI - Watershed restoration area level I

WRALII - Watershed restoration area level II

Secondary Factors			RANKING			
SWM objective flood prevention	yes	2				
SWM objective stream restoration (erosion prevention)	yes	2				
SWM objective water quality	yes					0
Watershed planned land use	Apts/Comm.	2	Townhouse	1	LDSS	0
Watershed potential imperviousness	high	2	medium	1	low	0
Watershed size	high	2	medium	1	low	0
Viewshed	compatible with env.	2	mildly campatible	1	mon compatible	0
Community Acceptance	support	2	indifference	1	resistance	0
Pond location within the shed (proximity to the problem)	close	2	moderately close	1	remote	0
Habitat preservation	no impact	2	medium impact	1	high impact	0
Wetland permit requirements	no	2	possible	1	required	0
Modified design	Highy modified	5	avg modification	2	none	0
Pond site conditions (slope, sensitive areas, soil type.. etc)	favorable	2	average	1	not favorable	0
SPS management category	WRALII	2	WRALI	1	WPA	0
% Natural sensitive areas/tree cover/ riparian buffers	low	2	medium	1	high	0
Potential for other practices	low	2	medium	1	high	0
Economic benefit	high	2	medium	1	low	0
TOTAL		35				

PRIMARY FACTORS WORKSHEET

Primary Criteria	Score	Total	Primary Criteria	Score	Total
Site/Land Availability			**Proximity to existing dwellings**		
BOARD owned site	**3**		Pond adjacent to single family dwellings.	**0**	
Park Authority owned land	**2**		Pond adjacent to town houses	**1**	
Existing storm drainage easements	**3**		Pond adjacent to appartments	**2**	
Privately owned with development potential	**1**		Pond not adjacent to habitable structures	**3**	
Privately owned with no development potential	**0**				
Funding Potential			**Existing watershed development levels**		
Constructed at private development's expense			Watershed fully developed	**1**	
with reimbursement	**3**		Watershed partially developed	**2**	
Sufficient un-used pro-rata funds within the watershed	**2**		Watershed undeveloped	**3**	
To be budgeted within the next 5 years	**1**				
Unknown budget horizon	**0**				
Special agreements/requirements/Regs.			**Archeological/Historical impacts**		
Required by development proffer/SE, SP condition	**3**		Known historical events on pond site	**-10**	
Required by Federal State or local regulations	**1**		Site contains noted heritage resources	**-10**	
Required to meet MS4	**1**		Site has archeological significance.	**-10**	
Required to meet Chesapeake Bay requirements	**2**		Site in visual proximity to property		
Required to meet TMDLs	**2**		with the above features	**-5**	
			Pond site within the Historic Overlay district	**0**	
Timing (of Development)			**Endangered species Impacts**		
Pond needed for adjacent development	**3**		Site contains the habitat of a known		
Pond proffered to be built by developer	**2**		endangered specie.	**-10**	
DPWES to implement project (short term)	**2**		Site close to the habitat of a known		
DPWES to implement project (long term)	**1**		endangered specie.	**-8**	
No plan to implement project	**0**				