SB 839 Matrix to Select Methods for Development of SVF Flow Prescriptions
Description and Implementation

Introduction

Senate Bill 839 (2013) established a Water Supply Development Account in order to provide a public cost match to Oregonians seeking to develop water resources projects.

For water storage projects (above and below ground) that require a water right authorization and are seeking public funding under SB 839, the bill sets forth specific requirements. These requirements are triggered by water storage projects that are: impounding surface water on a perennial stream, or diverting from a stream supporting sensitive, threatened, or endangered (STE) fish species, or diverting more than 500 acre-feet of surface water annually. (Sect. 13(1)).

The bill specifies that for such storage projects, the state must determine whether seasonally varying flows (SVFs) have been established for the stream. If SVFs have not been established, the state must establish SVFs before awarding public funding. (Sect. 13(2)).

It is important to note that before a flow prescription study method is identified, the project will be scoped using standard OWRD storage application criteria and that all projects will adhere to existing rules and regulations (e.g., Division 33). Every proposed project that does not yet hold a water right will be initiated using the standard OWRD application process. The applications include information about the storage project (e.g., source of water, dam height/ composition, primary outlet works, etc.) and information about how the stored water will be used (e.g., place of use, type of use, water management, etc.). The review of these applications will include an analysis of available water according to the 50 percent exceedence criteria.

Seasonally Varying Flows (SVFs) – as defined in Senate Bill 839 – mean the duration, timing, frequency and volume of flows, identified for the purpose of determining conditions for a new or expanded storage project, that must remain instream[1]... in order to protect and maintain the biological, ecological and physical functions of the watershed downstream of the point of diversion, with due regard given to the need for balancing these functions against the need to store water for multiple purposes. (Sect. 1(2)).

More specifically, the functions that must be protected, according to the bill, include but are not limited to: stream channel development and maintenance; connectivity to floodplains; sediment transport and deposition; migration triggers for upstream

[1] The ellipses [...] refer to text removed at the recommendation of the task force. The phrase "outside of the official irrigation season" should be deleted. Instead, the methodology described here specifies that the approval process for these projects should rely on the Department's determination of "when water is available for storage" in order to be consistent with the methods the state uses to evaluate and permit water storage projects.

movement of adult fish and downstream movement of fry and juvenile fish; fish spawning and incubation; juvenile fish rearing; and adult fish passage. (Sect. 19(4)).

The following narrative describes the methods the SVF Task Force recommends that the Water Resources Commission approve for the development of SVFs. The narrative focuses on the methods that will be used to develop a flow prescription that describes the necessary duration, timing, frequency and volume of flows, including the necessary floor flow, (i.e., ecological baseflow), that must be protected instream to protect and maintain biological, ecological, and physical functions.

The fundamental drivers for choosing an appropriate SVF method are the likely ecological impact to the site (i.e., attributes of the project relative to the attributes of the site), and how much information already exists about the ecological flow functions of proposed stream.[2]

Note that this approach responds to the economic feasibility realities noted in SB 839 (i.e., Many of the functional benefits to watersheds from water storage will not occur unless a new water storage project is financially feasible; and new water storage will not be appropriate or feasible in many locations).

SB 839 Matrix and Narrative: Determination of Flow Prescription Methods

The worksheet titled the "SB 839 Matrix to Select Methods for Development of SVF Prescriptions" and its supporting narrative (SB 839 Matrix), were compiled in order to identify the level of effort and subsequent study methods necessary for the SB 839 SVF prescription process. The SB 839 Matrix uses a series of questions to scope a given project's likely ecological impact and assess the quantity and quality of available information about ecological flow functions. The answers to these questions direct the user to the recommended study method (i.e., data collection and analysis) for a given project.

The SB 839 Matrix also relates questions about specific ecological data and analysis to streamflow functional bands discussed within the bill: Biological, Hydrological, and Hydraulic/Physical Processes. These bands are the basis for the development of a flow prescription and relate directly to the streamflow functions listed in the bill (Sect. 19(4)). Table 1 identifies the specific streamflow functions and where they will be addressed within each of the streamflow function bands. Ultimately, the completed studies and analyses for each band will be used to determine the necessary flow prescription.

[2] The level of effort required to create a flow prescription should correspond to how the project relates to its biological and physical setting. As the proposed project increases in water requested relative to water available, risk to ecosystem functions, and complexity, so too will the level of detail necessary to develop a flow prescription.

Streamflow Function Bands	Streamflow Functions Listed in SB 839							
	stream channel development and maintenance	connectivity to floodplains	sediment transport and deposition	migration triggers for upstream movement of adult fish	migration triggers for downstream movement of fry and juvenile fish	fish spawning and incubation	juvenile fish rearing	adult fish passage
Biological Band				x	x	x	x	x
Hydrological Band	x	x	x	x	x	x	x	x
Hydraulic / Physical Processes Band	x	x	x			x	x	x

Table 1. Comparison of streamflow functions listed in SB 839 and the streamflow function bands. The "X" under each streamflow function indicates which streamflow function bands will provide analysis or information for the streamflow needs of that function.

Application of the SB 839 Matrix

The following steps are used to implement the SB 839 Matrix:

Step 1) What is the Level of Ecological Impact of the Proposed Project?
Start at the column titled, "Questions to Discern Impact of Project." These questions are intended to identify proposed projects that are more likely to interfere with the biological, ecological, and physical functions protected by SB 839. Answers to the following questions will help determine whether the project is likely to have minimal or significant impact at the project site and what level of effort should go into creating an SVF flow prescription[3]:

- Is this project diverting from a stream with sensitive, threatened, or endangered species?
- Is the impoundment located in-channel?
- Does the impoundment or proposed project have an impact on sensitive habitat/process?
- Of the remaining available water in the basin, is the project proposing to divert more than half?
- Is a majority of available water already developed in the basin?

Once each question in the column "Questions to Discern Ecological Impact of Project" has been answered Yes ("Y") or No("N"), move to the box titled, "Impact of Project Score." Here, if any of the above questions were answered "Yes," then circle "Significant." If all answers to the above questions were "No," then circle "Minimal." This is the impact score for the project.

[3] Scoping must be done at the outset in collaboration with the technical review team and at other decision points along the way, so that money and resources can be focused on projects that are going to be successful.

Step 2) <u>What Type of Information is Already Available?</u>
Next, move to the column titled, "Questions to Discern Availability of Information about Streamflow Functions." "Sufficient" information means enough scientific information collected using standard biological, hydrologic, or hydraulic methods to develop the recommended flow prescription. Answers to the following questions are used to summarize the availability of scientific data sets and analysis:

Hydrological Band:

① Are there sufficient long-term data to understand the natural hydrograph?
② Is there sufficient information to understand climate driven shifts to the flow regime?
③ Is there sufficient information about water availability?

Biological Band:

④ Is there sufficient information about all species present at/below the point of diversion and their lifecycle needs?

Hydraulic / Physical Processes Band:

⑤ Are there habitat studies that provide sufficient information to understand the relationship between selected habitat features and streamflow?
⑥ Are there geomorphological studies or data that provide sufficient information to understand the relationship between sediment transport and streamflow?
⑦ Are sufficient stream data available to describe stream complexity and floodplain connectivity?
⑧ Are sufficient water quality data available, particularly related to temperature?

Acceptable scientific data sets and analysis collected using standard biological, hydrologic, or hydraulic methods may come from public, private, and non-profit sources and should meet appropriate quality assurance standards. Reliable sources of publically available information include:

- Hydrological Band: Oregon Water Resources Department, US Geologic Survey Oregon Water Center, US Army Corps of Engineers, National Weather Service, Oregon Climate Service, Northwest River Forecast Center, Bureau of Reclamation, University System of Oregon.

- Biological Band: Oregon Department of Fish and Wildlife, US Fish and Wildlife, National Oceanic and Atmospheric Administration, Oregon Watershed Enhancement Board/Watershed Councils of Oregon, University System of Oregon.

- Hydraulic / Physical Processes Band: Oregon Department of Fish and Wildlife, Oregon Department of Environmental Quality, Oregon Department of Gems and Mineral Industries, Oregon Department of State Lands, Oregon Department of Forestry, US Army Corps of Engineers, US Geologic Survey Oregon Water Center, Federal Emergency Management Administration,

Oregon Watershed Enhancement Board/Watershed Councils of Oregon, University System of Oregon.

Once each question has been answered Yes ("Y") or No ("N"), move to the column titled, "Availability of Information Score." Here, mark for each question whether the availability of information is sufficient or insufficient. If "Yes" was circled in "Questions to Discern Availability of Information," then circle "Sufficient." If "No" was circled, then circle "Insufficient."

Step 3) Combine Scores of Steps 1 and 2

Next, move to the column in the main matrix titled, "Combined Scores from Steps 1 and 2." Here, combine the "Availability of Information Score" and the "Impact of Project Score" into a single box. For example, if the "Impact of Project Score" was "Minimal," and the "Availability of Information Score" was "Sufficient", then write "Minimal, Sufficient." There will be a total of eight combined scores. A description of the meaning of these combined scores can be found in Table 2 of this narrative.

Step 4) Determine Which Study Methods to Use

Once the combined scores for each question have been identified, the table to the right of the main matrix can be used to identify likely "Resulting SVF Study Methods Used to Develop Flow Prescription" (also see Table 2). These study methods consist of two categories: 1) Data Collection Methods, and 2) Analysis Methods. Each study method category consists of a spectrum from simplest to most complicated method and each method is inclusive of all simpler methods listed before it. The two Resulting SVF Study Methods categories are as follows:

Data Collection Methods (listed in order from simplest to most complicated; each entry is inclusive of all simpler methods):

- *Literature and expert review*: collection of information and data from existing scientific literature and opinions from science subject experts;
- *Field visits (3-30 days)*: collection of additional data; likely used to supplement existing data, though not enough for extensive model development;
- *Field work (1-6 months)*: collection of additional data; likely used to supplement existing data and may be enough to build/calibrate site specific models;
- *Scientific expert workshop (6-12 months)*: a workshop consisting of scientific experts may be used to derive a best professional opinion relating data to streamflow functions and identifying additional data sources;
- *Field investigation/study (1-3 years)*: a scientific study related to the monitoring and/or measurement of a flow function in order to determine the necessary flow prescription.

Analysis (listed in order from simplest to most complicated; each entry is inclusive of all simpler methods):

- *Calculations*: application of basic analytical approaches; gives general understanding of flow function needs;
- *Existing models*: utilization of existing models (e.g. PHABSIM) that may require inputs of field or other data;
- *Scientific expert workshops*: peer-reviewed, group assessment of flow function needs and development of flow prescriptions;
- *Develop and run models*: creation and utilization of a model for a specific site or basin.

With study methods identified, a study plan can be determined and executed at a level acceptable to OWRD. Once complete, a flow prescription can be developed. OWRD, in consultation with the Oregon Department of Fish and Wildlife and affected Tribes, may approve the flow prescription or determine that water cannot be diverted from the channel in a method consistent with the language from SB 839. (Sect. 13(3)).

Resulting "Impact of Project" and "Availability of Information" Scores	**Combined Score Descriptions**	**Resulting SVF Study Methods** (see narrative Step 6 for details)
Sufficient, Minimal	Data are available and impact is limited. Simplest approach; minimal field visits and general analysis	**Data Collection**: Field visit, and/or literature and expert review **Analysis:** Existing models and/or calculations
Insufficient, Minimal	Impact remains small, however data is unavailable. Additional site-based data collection is necessary, though analysis remains general.	**Data Collection:** Field work, field visit, and/or literature and expert review **Analysis:** Develop models, scientific expert workshop, existing models and/or calculations
Sufficient, Significant	Despite sufficient data, significance of impact requires careful review and analysis. Supplementary data collection and detailed analysis.	**Data Collection**: Field work, field visits, and/or literature and expert review **Analysis:** Develop models, scientific expert workshop, existing models and/or calculations
Insufficient, Significant	Data is not available and the project will likely have a large impact on ecosystem functions. Most complicated approach; significant data collection and field work and detailed analysis.	**Data Collection**: Field investigations/study, scientific expert workshop, field work, field visits, and/or literature and expert review **Analysis:** Develop models, scientific expert workshop, existing models and/or calculations

Table 2. This table expands on "Step 4: Determine Which Study Methods to Use to Address Each of the Functional Band Questions," presented in the SB 839 Matrix. The additional column, "Combined Score Descriptions," offers a simple description of the score and the effort required to collect and analyze the relevant scientific data.