DELAWARE RIVER BASIN COMMISSION
REGULATED FLOW ADVISORY COMMITTEE
February 16, 2012

MEETING SUMMARY

The February 16, 2012 Regulated Flow Advisory Committee (RFAC) meeting began at approximately 10 a.m. at the Delaware River Basin Commission (DRBC) offices in West Trenton. Ms. Stefanie Baxter of the Delaware Geological Survey chaired the meeting. Introductions were made around the room and via telephone for those attending on a conference call.

Review of minutes from the October 5 RFAC meeting

The October 5, 2011 RFAC meeting minutes were approved as drafted.

Brief report on Decree Party work group progress

Stefanie Baxter reported on progress made by the Decree Party work group towards a new FFMP agreement. In May 2011 the decree party principals directed the work group to come up with a five-year plan with a three-year initial agreement, with an option for two one-year extensions. The group was told to work on technical issues and a work plan until December; if enough progress was made up to that point, work would start on the next rendition of the FFMP-OST. The group spent a significant amount of time developing a list of priorities for the reassessment study. Tasks were divided into four sets depending on what entity would be responsible: the work group, the USGS (through WaterSMART), the Corps of Engineers, and an outside consultant; this list was presented to the principals. On November 2-3, 2011 there was an OST workshop and reservoir tour. The workshop was extremely informative; while many questions were answered, it also raised more questions as to how the OST model actually works. NYC DEP staff performed a limited number of model runs using the NYC OASIS OST model to help the work group understand how the whole NYC reservoir system operates. The down basin states provided NYC with a list of additional possible runs that they would like to see; those runs are temporarily on hold because NYC is moving their offices to West Chester and are unable at this time to do the model runs. Thom Murphy stated that the model runs that are necessary for development of the next FFMP will be prioritized. Also at the OST workshop, NYC briefed the decree parties on their system-wide safe yield calculation. Further discussion on this issue has been put on hold, since the work group has been tasked with working exclusively on the next FFMP-OST program.

Stefanie reported that on January 19, 2012, the principals stated that the work group needs to refocus its complete attention to the next releases program and are not to engage in any policy discussions. Specifically, the work group was directed to develop release program alternatives to enhance flood mitigation and to assist in supporting of the 85-mgd NJ canal diversion; the alternatives are to be comparable to the existing program in terms of drought risk. The principals asked the group to present a starting list of alternatives on February 22 (after approximately one month of work), indicating impacts, either positive or negative, to the fisheries, to flood mitigation, to the Montague and Trenton flows, to the NJ diversion and to NYC water supply. The work group was told to set aside all discussions on the reassessment study until agreement is reached on the new releases program. However, in developing alternatives, the group was encouraged to “think out of the box,” while leaving policy discussion to the principals.

Stefanie reported that, two weeks ago, Hazen and Sawyer delivered to DRBC a prototype OASIS model that represents the FFMP-OST program. DRBC staff has been working diligently to get up to speed on the new model in order to help the decree party work group with runs and analyses to test FFMP alternatives. Later in today's agenda, Hernán Quinodoz is going to discuss in more detail how the model transfer went and what they can or cannot do at this point. Stefanie said the work group is planning more model runs and analyses between now and when the current plan expires on May 31. The three model runs already done were the ones that could get done quickly and on time for the February 22 meeting. One run dropped the CSO plateau down to 85% instead of 90%; two other model runs altered the CSO rule curves to start refill at a later dates (e.g., instead of March 15, refill season starts on April 1). Results of those runs are now being analyzed before presenting them to the principals. Mary Ellen Noble asked if the design of the model runs requested of NYC by the down basin states could be made available to the public. Stefanie agreed to provide that information via email to the RFAC distribution list.

Peter Kolesar asked about plans to make available to the public the model runs and analyses planned by the work group. He said evaluating the impact on fisheries requires DSS analysis, which in turn requires output from OASIS runs. Stefanie responded that she thought that both run descriptions and model results could be made available after presented to the principals. Thom Murphy noted that releasing this information would need principals' approval. Mary Ellen Noble asked what the criteria for approval by the principals are. Stefanie stated that such criteria had not yet been set.

Update on Delaware River Master Office staffing

Steve Blanchard gave an update on Delaware River Master Office staffing. He noted that the Delaware River Master (DRM) Office exists based on the 1954 Supreme Court Decree and is staffed by three people. The River Master (Steve) is a part-time position at the USGS headquarters in Reston, VA; the Deputy River Master (Gary Paulachok) and an assistant (Bruce Krejmas) are two full-time positions in the Milford, PA office. Steve said he retired in June but was re-hired to do only the Delaware River Master part of his previous job (he is allowed to do this for up to five years). Steve said both Gary Paulachok and Bruce Krejmas retired on December 31, 2011. Gary Paulachok was re-hired back and he is working half-time staffing the Milford office. Last fall, a vacancy was posted and a search conducted to replace Gary, but the selected candidate turned it down. The vacancy has since been posted again and there is a new pool of candidates under review. Gary plans to stay on mentoring his replacement indefinitely as long as necessary (he is allowed to work up to half-time under the law for up to five years). Steve said the USGS has recently posted the vacancy to fill Bruce's position. Peter Kolesar said he wanted to make a special mention of the wonderful job that Gary Paulachok has done over the years as Deputy River Master. Stefanie agreed and said she hoped to be able to honor Gary at the next RFAC meeting; the committee will also honor Norm McBride, who is retiring in May from NYS DEC fisheries.

Update on USGS Delaware River Basin WaterSMART Initiative

Bob Tudor gave an update on the USGS Delaware River Basin WaterSMART Initiative, part of US Department of Interior program aimed to develop information to assess water use, water availability and water supply needs. The Delaware is one of five focus areas in the country where a pilot study will be carried out. The Delaware River Basin (DRB) is data-rich compared to other parts of the country, with many gages that go back about 100 years. Bob said DRBC has been active in trying to work with USGS to leverage those dollars and talent to produce outcomes of interest to our stakeholders and the Commission. DRBC has put together a sustainable water

future strategy and the USGS initiative plays into it as a component. The project manager for the DRB study is Ward Freeman, director of the USGS NY Water Science Center; he has put together a large team that includes staff from the other USGS water science centers in the DRB and USGS experts from other parts of the country to assist with modeling. A stakeholder meeting was held in September to gather input before preparing an initial draft work plan. The draft work plan will be posted online once finalized; a website will be set up to post updates, data and study products. The work plan will focus on addressing the gap areas identified by DRBC and stakeholders. The total project budget for the 3-year DRB study is $1.5M for the USGS water division. There is a separate budget under the USGS ecosystems division; their work plan includes upgrading the DSS computer program used to estimate instream habitat in the Upper Delaware River.

Bob reported on related efforts by other groups. In September DRBC got conditional approval to enter into a contract with The Nature Conservancy (TNC) to define ecological flow needs and flow endpoints for different regions in the DRB. This effort could provide the scientific basis for DRBC establishing minimum ecological flow requirements at some point in the future, not only for the mainstem river but the tributaries as well. The TNC study will include literature review, advice from an expert panel, and policy options to address some of the findings. The USGS study has a related component, which will model ecosystem responses (fish and macro-invertebrates) to flow alterations in the DRB. The primary contact person with the TNC for this study is Michele DePhilip, TNC PA chapter. Bob Tudor said a TNC representative will give a presentation at the next Commission meeting on TNC's "Conservation Initiative" that lays out the strategy for conservation of fresh water ecosystems and tidal wetlands and marine bivalves. The strategy is focused on the land area adjacent to the streams and rivers, including headwater complexes, floodplains, riparian corridors, and non-tidal wetlands.

Another component of the USGS study will focus on hydrologic modeling of watersheds, considering water stresses, growth and population centers, effect of land use and change, effects of climate variability and climate change. DRBC would like to link findings to existing management endpoints such as the Montague flow target or the salt front in the tidal Delaware River, and how meeting goals for these endpoints could change 20, 30, or 40 years down the road due to more droughts and more extreme precipitation events, under various growth scenarios. The USGS is considering using the Water Availability Tool for Environmental Resources (WATER), a modeling tool previously used in studies of the Great Lakes. WATER is similar to PRMS in letting the user choose different scenarios of monthly precipitation over the landscape and evaluate the hydrologic consequences. In response to a question Bob noted that there is no decision yet about future stakeholder meetings, although other types of outreach efforts may be used.

Glenn Erikson commented that similar work on habitat and watershed modeling has been done as part of the Great Lakes Initiative. Bob noted that DRBC is trying to set up similar collaborations with other federal agencies. NOAA is putting together a work plan that could complement the USGS work plan, focusing on flood warning and flood modeling. The Army Corps of Engineers has been pursuing Integrated Water Resources Support Services (IRSS) and their first proof-of-concept area will be the DRB; DRBC is currently working on a work plan with the Army Corps of Engineers. In response to questions, Erik Silldorff provided clarification on the scope of the ecological flow studies. He said while The Nature Conservancy project is likely to focus on hard rock geological areas above the coastal plain, the WaterSMART USGS project will look at all habitats within the basin (coastal plain, mainstem river, tributaries, etc.). Flow needs for the warm water communities will be evaluated. However, there are not sufficient resources to tackle other known issues such as ecological flows for oysters. Peter Kolesar cautioned against designing a

work plan that will try to accomplish too much ("a mile wide and an inch thick") and encouraged DRBC to influence the USGS work plan to have a few tasks but be able to do them well.

Equitable Apportionment Plan

Garth Pettinger, representing the NY Chapter of Trout Unlimited, presented what he terms a sustainable water management program for the Upper Delaware River (UDR) system, based on equitable apportionment of resources (presentation posted on the DRBC website). Garth argued that NYC's right to divert up to 800 mgd from the UDR system is based on prior apportionment outlined in the 1954 US Supreme Court Decree, despite findings from the subsequent 1960's drought-of-record that revised the UDR system safe yield to 480 mgd. He said past and present UDR system water management programs have been designed to maintain an 800-mgd diversion safe yield for NYC, at the expense of compensating releases to the rivers and down-basin states. He compared two sets of safe yield estimates: those reflected on the 1954 Decree and those calculated after the 1960's drought. In 1954 the NYC system safe yield was 1,665 mgd and after the 1960's drought was 1,290 mgd; in 1954 the UDR diversion safe yield was 800 mgd and after the 1960's drought was 480 mgd.

Garth said the Croton and Catskill systems' safe yields are underutilized: USGS streamflow gage data indicates significant dumping of excess water from the Croton and Catskill systems at three locations: New Croton Dam discharge to the Hudson; Gilboa Dam discharge to Schoharie Creek and Ashokan Dam discharge to Esopus Creek via the reopened Ashokan waste channel. A clear progressive increase in discharge rates from 1983 to the present day is evident, indicating a steady reduction in use of the Croton system (and its 240-mgd safe yield); this development is coincident with the "Good Faith Agreement" of 1983. The safe yield of the Schoharie watershed (Catskill system) is approximately 230 mgd, and yet NYC diversions (via the Shandaken Tunnel) over the long-term have averaged only 160 mgd, representing a further underutilization of 230 - 160 = 70 mgd of safe yield. Then adding 240-mgd from Croton and 70-mgd from the Catskill system yields 310-mgd of "lost" safe yield. Garth argued that this "lost" safe yield is made up from other sources: increased diversions from the Delaware system. He presented other calculations that come up with similar figures.

Garth concluded that the Equitable Apportionment Plan (EAP) links both release and diversion rates to the anticipated available water quantity, based on: reservoir level; refill requirements; inflow profile (based on the hydrological conditions of the previous three months); and long-range hydrological forecast. He gave the following bottom line assessment of the EAP: provides and restores a sustainable and equitable apportionment of resources between all parties; keys both releases and diversions to the available water quantity; provides NYC with more water than traditional plans; shares the risk of the future; and safeguards the future interest of the lower-basin states. He said the best timing to implement the EAP is 2013, upon full commissioning of the Croton Water Treatment Plant.

A question-and-answer period followed, with clarifying questions from Peter Kolesar, Hoss Liaghat, Stefanie Baxter and others. Garth said the "Good Faith Agreement" has run its course and a new agreement is needed to manage the system when Croton comes on line. Both releases and diversions are tied to the available water quantity and NYC has to adjust their diversions when conditions get dry. Brenan Tarrier commented and asked a number of detailed questions on many presentation slides. Regarding the claim of the Schoharie system being under-utilized, he noted that this is not because of NYC's choice but because of a lawsuit brought by Trout Unlimited, Catskill Mountain Chapter. He said this puts limitations on how the Shandaken Tunnel can be used (160-mgd maximum diversion) because of turbidity and temperature limits to

protect the wild rainbow trout fishery. Regarding a proposal to dedicate 83% of the City's surplus water to releases from the three NYC Delaware River Basin reservoirs, Brenan said this would short-change the tailwaters from the other 15 NYC reservoirs. He said stealing from Schoharie Creek or Rondout Creek to feed the West Branch Delaware River was not a good idea; instead, he advocated for balancing habitat concerns at all tailwaters in the NYC system. Other concern raised by Brenan was that large (600-cfs) summertime release rates at Cannonsville run the risk of depleting the available cold water volume before the end of the summer.

Plans for March SEF meeting

Mark Hartle reported on plans for a Sub-Committee on Ecological Flows (SEF) meeting on March 13 at DRBC. The following items will be on the agenda: (1) start a lower-basin workgroup and identify issues that are specific to the lower basin; (2) thermal release rules and options that could come into play for more automatic releases if a thermal bank were available; (3) release rates from the three Delaware River Basin reservoirs and habitat values they produce (this will be a status review); and (4) OASIS DRBC OST model outputs that could serve as indicators of impacts to ecological components and how to interface such indicators with the DSS program in specific analyses.

Transfer of NYC OASIS-OST model to DRBC

Hernán Quinodoz reported on the transfer of the NYC OASIS-OST model to DRBC. He noted that the current version (June 2011) of the FFMP has NYC reservoir releases determined by the NYC OASIS-OST model, a tool that has been under development by NYC and their consultants. At recent RFAC and SEF meetings there have been questions as to how the OST model could be made available and how some OST components could be incorporated into the existing DRB OASIS. The major conceptual change between the old FFMP and the new FFMP is that the releases are calculated based on forecasting the amount of water available in the near future – this requires a totally new algorithm. At the last RFAC meeting the question was framed in terms of being able to have a program module that can be placed into the existing DRB OASIS to calculate releases using the OST algorithm. Soon after the October 2011 RFAC meeting, NYC staff approached DRBC staff to work together on this project and produce such an updated DRB OASIS model.

Staff from DRBC, NYC and Hazen and Sawyer, consultants to NYC, met to discuss possible ways to accomplish the objective. The initial idea was to find out the simplest way to do it, which appeared to be to sit side-by-side with one OASIS model on each computer and see what parts of the program (OST) can be imported into the other model (DRB); ideally most of the code in the OST model would be left alone if the objective is to update only the reservoir releases module. However, upon trying this method on a working session, NYC and their consultants determined that this method would become more complicated than originally thought. Instead, they went back to their office to take the full NYC OASIS-OST model that has the Catskill, Delaware, and Croton systems and cut away all program modules and information that do not pertain to the Delaware River Basin (DRB). The result is a DRB-only OST model that has the same geographic extent and reservoirs as the existing DRB OASIS model. This new tool was electronically provided to DRBC on February 3; a meeting was held on February 10 to ask questions and review it. The Hazen and Sawyer consultants provided some preliminary comparisons of the full NYC OST and the DRB-only OST models; their assessment was that the two models seem to produce similar results when driven by the same inputs. DRBC staff will carry out further testing and comparisons.

Hernán said the ultimate goal is to have a DRB-only OST model that can be released to all interested parties, as done with previous versions of the DRB OASIS model. When all parties and stakeholders are working with the same tool, comparisons are straight forward and transparency is a given. However, getting to the point where the model can be released requires first making sure that the model does what is expected to do. Hernán said the new model is not at that point yet. Recognizing that the new model incorporates many updates, extensions and modifications with respect to the OASIS model that DRBC provided years ago, a careful review will be necessary. Ideally, the model review would be completed before using the new model. However, this time the Decree Party principals asked for some preliminary analyses on a very short time frame (before the review can be completed). In this situation the only choice is to assume that the new model accurately represents the FFMP-OST rules and all other reservoir operations rules – this is the baseline run. Alternatives where simple changes are made to the baseline can be tested, but comparisons carry a major caveat: these are screening-type analyses, best suited to compare relative differences (i.e., selected metrics may go up or down, or move to better or worse conditions). Back to the model review task, the first major step is for the modelers to get a reasonable level of confidence in the tool; the second step is to have the Decree Parties understand the tool and be confident that it produces the expected results; the third step is releasing the new model to all interested stakeholders that have an OASIS license.

A question-and-answer period followed. Peter Kolesar said he would not like to end up with a new OASIS model where some components are “black boxes” (unknown contents). Hernán replied that the OASIS framework is the same as in the past: the model has computer code, data, parameters and inputs and these are all available and transparent to the user when running the model – nothing is hidden. Other questions dealt with features of the NYC OST model and FFMP-OST program alternatives that could be considered. Stefanie Baxter noted that a group of concerned flood citizens met with each of the principals and one of their suggestions was to have a 3% storage void for early spring instead of full reservoirs. Analysis of the 3% storage void is on the list of runs that the work group would like to make, although it could not be done in time for this next Decree Party principals meeting. There might be a tradeoff to evaluate: when there is a void in place, the highest-level fishery releases are not available; the model will determine the prevalence of each situation. Thom Murphy said such runs will show where you benefit and where you take a hit.

Someone asked how can you justify backing a model that cannot be put into action when certain actions are called for? Thom Murphy said the model is useful to test the achievability of any proposal. You can use the model to test a storage void of any given size at any time of year; the model is constrained by the physical limitations of what the facilities can do and also what you are going to receive from nature – model results will reflect what is feasible. Hernán said the model is a great tool to let you do “what if” comparisons and it can be any “what if” that you want. You can put a 20% storage void year-round and see what happens. The model will tell you how many years you can achieve that goal and it will show that in many of the wet years you cannot get to 20% (maybe you cannot get to 10%). Then you bring those results to the policy makers and they decide which way to go.

Someone commented that during Hurricane Irene there were no diversions; then stated that all these models are good on paper but cannot match what happens in reality. Hernán said you are always trying to get the model closer to reality, but with reservoir diversions you can never assume that they will be what you put in. Again, you can use the model to test various levels of diversions if that is what you are interested in. But diversions in reality will be highly variable. All agreements, from the Supreme Court Decree to the FFMP, only set bounds on acceptable NYC diversions. For example, during drought operations NYC can take anywhere between 0-520

mgd, but no one can force the diversions to be exactly 520 mgd on any given day. Reality will never be like the model but hopefully we will be within the bounds that the model can predict.

Glen Erikson said he and others have been asking for higher flows (closer to those provided in the Rev 7 releases program) on the East Branch Delaware River for some time. Stefanie said this is one of the topics to be discussed at the next SEF meeting, with the goal of coming up with recommendations to consider. Hoss Liaghat stated that the FFMP releases are based on the white paper that reflects the consensus of PA and NY fisheries managers. Someone noted that Glen is asking to revisit the white paper recommendations. Brenan Tarrier noted that the East Branch concerns are on the parties' radar but are not on the list of first-year proposals. Peter Kolesar noted he presented results last spring showing that the system could accommodate larger releases to the East Branch.

Next meeting date

The next RFAC meeting will be on Tuesday, April 17, 2012 at 10 a.m. at DRBC. The agenda will include a presentation by Anthony Fiore from NYC, reporting on the hydropower projects under development.

Opportunity for public comments

Peter Kolesar circulated hard copies and briefly discussed a handout titled "Designing an Effective Emergency Thermal Relief Program." This is a study that he and colleagues are carrying out, focusing primarily on summertime river temperatures in the upper mainstem of the Delaware River as recorded at the USGS gage at Lordville, NY. He said there are a variety of scientific views about what temperatures constitute stressful conditions for trout – depending in part on the trout species of interest. For the initial phase of the research they will focus on average temperatures of 75°C (23.0°C) or above as constituting stressful conditions. They hope to collaborate with the Decree parties and the DRBC through RFAC and SEF. Stefanie said she was hopeful that new rules for thermal releases could be approaching the point where they could be evaluated and written into the FFMP. Someone asked the parties to develop some more rules that are more automatic for consideration.

REGULATED FLOW ADVISORY COMMITTEE (RFAC)

February 16, 2012

ATTENDANCE LIST

NAME	AFFILIATION
ANDERSON, Kelly	Philadelphia Water Dept.
BAXTER, Stefanie	DE Geological Survey
BERNASCONI, Alessandra	Delaware Riverside Conservancy (DRC)
BLANCHARD, Steve	USGS, Office of the Delaware River Master
CACCAVELLA, Michael	DRC
DOMBER, Steven	NJ Dept. of Environmental Protection (NJDEP), NJ Geological Survey
ERIKSON, Glenn	Wild Trout Flyrodders
FRAZIER, Dean	Delaware County, NY
HAMILTON, Don (via phone)	National Park Service Upper Delaware Scenic and Recreational River (NPS UPDE)
HARTLE, Mark	PA Fish & Boat Commission
HARTMAN, Lee	Trout Unlimited
HESSON, Molly	Philadelphia Water Dept.
KOLESAR, Peter	Columbia University
LEWIS-COKER, Christine	U.S. Army Corps of Engineers (USACE)
LIAGHAT, Hoss	PA Dept. of Environmental Protection (PADEP)
LOVELL, Stewart	DE Dept. of Natural Resources and Environmental Control
MIRI, Joe	NJDEP
MURALIDHAR, D.	Hazen and Sawyer
MURPHY, Thomas	NYC Dept. of Environmental Protection
NOBLE, Mary Ellen	Delaware Riverkeeper
NORRIS, Marian (via phone)	NPS
PETTINGER, Garth	NYS Trout Unlimited, Delaware Committee
QUINODOZ, Hernán	DRBC
RESTI, Sherri	Friends of the Upper Delaware River
SERIO, Jim	Delaware River Foundation
SHALLCROSS, Amy	DRBC

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TUDOR, Bob	DRBC
WO, Jeromy	NorDel Conservancy
ZIGON-RICHARDSON, Valerie	DRBC