APPENDIX 6: Surface Water Diversions

Definitions

- **Diversion** – is the removal of either groundwater or surface water from the natural hydrologic cycle. The NJDEP Bureau of Water Allocation is responsible for granting the privilege to a person to divert over 100,000 gallons per day (gpd) of water for any purpose other than agricultural or horticultural use. The NJDEP maintains extensive databases on water usage. The ability to use full diversions is typically related to satisfying other criteria (e.g., surface water diversion can be limited based upon requirements to maintain a certain stream flow past the diversion – **passing flow**).
- **Depletive Water Use** – "surface or ground water withdrawn from a selected watershed and discharged in another watershed. Also referred by others as **out-of-basin transfers** (or inter-basin transfers) and wastewater and water exportations, depletive use has become a significant issue in New Jersey over the last several years as competition for water has increased."[1]
- **Safe Yield From Surface Sources** – means the yield maintainable by a water system continuously throughout a repetition of the most severe drought of record, after compliance with requirements of maintaining minimum passing flows, assuming no significant changes in upstream or upbasin depletive withdrawals.
- **Minimum Passing Flow** – surface water diversions are limited by requirements to maintain a certain stream flow, or passing flow, downstream of the water intake. The New Jersey Department's Bureau of Water Allocation has set these passing flow requirements. Where not specified, statutory minimum passing flow

is calculated as 125,000 gallons per square mile of contributing upstream unappropriated watershed for public water supplies.

Source: WMAs 3, 4, 6 Characterization and Assessment Studies (2002). Available at: http://www.njdwsc.com/prbwmp/intro.htm

The Wanaque and Monksville Reservoirs are owned and operated by the North Jersey District Water Supply Commission (NJDWSC). These two "run-of-the-river" reservoirs comprise one of the largest water supply/storage systems in New Jersey. This system is the primary source of drinking water for much of Passaic, Essex, Bergen and Hudson Counties. Following the completion of the Wanaque South Project in the late 1980s, the long-term safe yield of this combined reservoir system was upgraded to 173 mgd. The system currently provides approximately 160 mgd of potable water supply to its customers (including other water companies).

To maintain this yield, the Wanaque Reservoir utilizes inflows from three separate sources: (1) its natural tributary system, which includes the Monksville Reservoir; (2) the Pompton Lakes intake, which is located on the Ramapo River; and (3) the Two Bridges intake, which is located on the Pompton River about 750 feet upstream from the confluence with the Passaic River. The NJDWSC has the capability of pumping up to 150 mgd from the Pompton Lakes intake, and up to 250 mgd from the Two Bridges intake. By design, when the diversion from the Two Bridges intake exceeds the available flow in the Pompton River, this intake has the ability to reverse flows in the lowermost reach of the Pompton River and tap the locally impounded waters of the Passaic River. Thus, the entire upper Passaic watershed (with a drainage area of 361 square miles) becomes a contributing source to the Reservoir. To maintain water quality in the downstream portions of the Passaic, Pompton and Ramapo Rivers, NJDEP has implemented several restrictions on intake usage, including: (a) no diversions during July and August unless there is a declared drought emergency; (b) no diversions from the Pompton Lakes intake when flows in the Ramapo River are below 40 mgd; and (c) no diversions when flows in the Passaic River at Little Falls are below 17.6 mgd. (modified from Najarian (2005)).

Source: New Jersey Department of Environmental Protection (NJDEP). 2005a. Amendment to the Northeast, Upper Raritan, Sussex County, and Upper Delaware Water Quality Management Plans: Phase I Passaic River Study Total Maximum Daily Load for Phosphorus in Wanaque Reservoir Northeast Water Region (*proposed*).

North Jersey District Water Supply Commission

The North Jersey District Water Supply Commission (NJDWSC) operates Wanaque Reservoir (29.6 billion gallons) above the town of Pompton Lakes on the Wanaque River and the Wanaque South Project, including Monksville Reservoir, Wanaque South Pump Station and the Ramapo Pump Station. NJDWSC was created in 1916 by enactment of the State Legislature to help develop and operate water supply systems in New Jersey's 11 northernmost counties. The NJDWSC serves as agent or trustee representing the joint interests of municipalities that contract with the Commission to share in various water projects implemented by the Commission.

Beginning in 1920, the Wanaque North Project includes the original construction of Wanaque Reservoir and various improvements to raise the reservoir level. The NJDWSC, per Allocation Permit No. 5329, can divert:

> "the entire runoff of the watersheds, provided, however, that at all times the flow of the Wanaque River below the Raymond Dam shall be maintained at an amount not less than seven million gallons per day (10.83 cfs) plus such quantity of water up to three million gallons per day (4.64 cfs) is discharged from storage in Greenwood Lake for use other than the use of the NJDWSC, an amount equal to such draft from Greenwood Lake shall be discharged from the Wanaque Reservoir, and, in addition thereto, such amount as shall be required to make the total discharge from the reservoir at least ten million gallons per day (15.47 cfs)."

The Wanaque North Project also includes the Ramapo Pump Station (constructed in 1953 @ 100 MGD) that transfers raw water from the Ramapo River at Pompton Lake to the Wanaque Reservoir. As part of the Wanaque South project the pumping capacity and diversion limits were increased. There are two permits with diversion limits as follows:

Diversion Limits Ramapo River at Ramapo Pump Station

Permit No.	Permit Holder	Monthly Average Rate	Monthly Limit
5273	United Water NJ	25 MGD	775 MG
5274	NJDWSC	125 MGD	3875 MG

There is a 40 MGD passing flow requirement and other water quality constraints. No pumping is allowed between July 1st and August 31st.

The Wanaque South Project includes the construction of the Monksville Dam and Reservoir (7 billion gallons) in 1987. Integral to the Wanaque South Project was the construction of the Wanaque South Pump Station , which transfers water from the confluence of the Pompton and Passaic Rivers (Two Bridges) to the Wanaque Reservoir and/or to the Oradell Reservoir in WMA 5. There are two permits with diversion limits as follows:

Diversion Limits Pompton River at Wanaque South Pump Station (Two Bridges)

Permit No.	Permit Holder	Monthly Average Rate	Monthly Limit
5090	United Water	125 MGD	3875 MG
5094	NJDWSC	125 MGD	3875 MG

There is a 92.6 MGD passing flow requirement at the Wanaque South Pump Station. (Two Bridges site) and detailed water quality constraints. However, NJDWSC is allowed to pump the differential of flows between actual diversion by PVWC (total of diversion at Two Bridges and Little Falls (WMA 4)) and 75 MGD after passing 17.6 MGD. No pumping by NJDWSC is allowed between July 1st and August 31st. In addition, PVWC, as part of its Permit No. 5099 can divert up to 75 MGD at the Two Bridges site. The PVWC permit allows year round pumping at the Two Bridges site as long as certain downstream water quality criteria are maintained.

It is noted that the NJSWSP indicates that the safe yield from the Wanaque South Project is 79.0 MGD, and the safe yield from the Wanaque North Project is 94.0 MGD. According to the NJSWSP the total safe yield of the system, as currently constructed, is therefore 173 MGD.

In addition, the 173 MGD is currently completely allocated to the contracting municipalities as indicated in Table 1.16.10. Of this total, 133.5 MGD of finished water can be provided on an average daily basis by NJDWSC to contracting members (per their allotments) and up to the remaining 39.5 MGD can be provided on an average daily basis by NJDWSC to United Water NJ as raw water transferred to Oradell Reservoir.

Passaic Valley Water Commission

PVWC owns and operates the Point View Reservoir, which is a 2.8 BG raw water reservoir that can be filled from the Pompton River, via a pump station, at a monthly average rate of 50 MGD (per Allocation Permit 5099). PVWC can fill this reservoir with the restriction of an 88 MGD passing flow in the river. PVWC can then release water from the reservoir back into the Pompton River during low flow conditions for use at the Little Falls Water Treatment Plant located in Totowa on the Passaic River. In addition, during July and August when the Wanaque South Aqueduct is not utilized by NJDWSC, PVWC can convey water from Point View Reservoir directly to the Two Bridges site, for transfer to Little Falls.

PVWC can pump water from the Wanaque South Pump Station (Two Bridges) at the confluence of the Pompton and Passaic River, via a pipeline, to the head of the Little Falls Treatment Plant. PVWC can divert a maximum daily rate of 75 MGD or a maximum of 2,325 million gallons during any month at this location. Per the water allocation permit, pumping at the Two Bridges location is restricted by a passing flow requirement of 17.6 MGD and additional water quality parameters.

PVWC is the primary public water user within WMA 4. PVWC has a very complex arrangement for obtaining and supplying water to its customer base. PVWC supplies water to its retail customers (cities of Paterson, Passaic, and Clifton) and wholesale customers with a combination of supply, either from the Little Falls Treatment Plant (raw water supply from Passaic or Pompton River) or redistributing treated water received from the North Jersey District Water Supply Commission (NJDWSC). Table 1.16.3 provides a summary of the different entities that PVWC supplies water to, and an estimate of inter-basin transfer.

Table 1.16.7
NJDWSC Contracting Municipalities and Allotments

Municipality	Wanaque North		Wanaque South	
	% Share	Allotment (MGD)	% Share	Allotment (MGD)
Newark	40.50	38.070	14.342	11.33
Paterson[a]	20.00	18.800	n/a	n/a
Kearny	12.00	11.280	2.177	1.72
Bayonne	n/a	n/a	13.291	10.50
Passaic[a]	11.00	10.340	n/a	n/a
Wayne	n/a	n/a	11.392	9.00
Bloomfield	4.00	3.760	3.481	2.75
Clifton[a]	6.75	6.345	n/a	n/a
Montclair	5.00	4.700	n/a	n/a
Nutley	n/a	n/a	3.798	3.00
Cedar Grove	n/a	n/a	1.519	1.20
Glen Ridge	0.75	0.705	n/a	n/a
United Water[b]	n/a	n/a	50.00	39.50
Total	***100***	***94***	***100***	***79***

Notes for Table 1.16.7:

[a] Represented by Passaic Valley Water Commission
[b] Receives untreated water through aqueduct to Oradell Reservoir
Data from Annual Report of the Consulting Engineer (Killam Associates 2000)

PVWC Wholesale Customers using Passaic River (WMA 4) Supply
Table 1.16.3

Name	Avg. Demand (MGD)	Amount of Inter-Basin Transfer (MGD)
Township of Cedar Grove	0.14	0
Borough of Haledon	0.28	0
Town of Harrison	1.07	0
Borough of Elmwood Park	0.37	0
Township of Fairfield	1.47	0
Borough of Fair Lawn	1.37	0
City of Garfield	1.48	0
New Jersey-American Water Co.	6.3	6.3
(Commonwealth System)		
New Jersey-American Water Co.	0	0
(Little Falls System)		
Borough of North Arlington	1.71	0
Borough of North Caldwell	0	0
Township of Nutley	3.26	0
Southeast Morris County MUA	1.4	1.4
Borough of Totowa	0.94	0
Township of Verona	1.43	0
Borough of Walllington	1.2	0
Borough of West Paterson	0.74	0
Total	23.16	7.7

Table adopted from PVWC Water Distribution System Master Plan - Historical Demands, Killam Associates, 1999

In WMA 3:

Table 1.16.11
Summary Statistics on Major Surface Water Diversions

Purveyor	Location	Safe Yield (MGD)	Allocation (MGD)	Diversion Avg. 1990-1999 (MGD)	Diversion Avg 1999 (MGD)	Reservoir Capacity (BG)	Interbasin Transfer (avg 90-99) (MGD)	Depletive Use (avg 90-99) (MGD)
PVWC	Pompton River (Point View Reservoir) (Permit 5099)	na	50	na	na	2.8	na	na
PVWC	Pompton River (Two Bridges) (Permit 5099)	na	75 (1)	47 (1)	47(1)	na	see note 1	see note 1
NJDWSC	Wanaque River (Permit 5329)	(2)	(2)	120	121 (4)	37(3)	-120	-120
NJDWSC and UNWNJ	Ramapo River (Permit 5274 and 5273)	(5)	(5)	16	24	na	0	0
NJDWSC and UWNJ	Pompton River (Two Bridges) (Permit 5094 and 5090)	(5)	(5)	35	53	na	na	na
City of Newark	Pequannock Watershed	49	49	47	47	14	-47	-47

na - not applicable/available
(1) Allocation Permit 5099 provides allocation that is shared between Pompton River at Two Bridges (Wanaque South Pump Station) in WMA 3 and the Passaic River intake (Little Falls) in WMA 4. Available information does not provide the diversion from Pompton River separately from Little Falls.
(2) From NJSWSP, total safe yield is 173 MGD. Allocation is based upon safe yield.
(3) Combined total of Wanaque and Monksville Reservoirs
(4) NJDWSC diversion 107.6 MGD; UWNJ diversion 13.4 MGD
(5) Water from these sources is pumped back to the Wanaque River or to Oradell Reservoir in WMA 5.
(6) Not listed is the Borough of Butler Kakeout Reservoir which is provides approximately 0.7 MGD to the surrounding community.

In WMAs 3 and 4:

Table 1.16.12
Passing Flows

Purveyor	Gaging Station	Passing Flow per NJAC 7:19 (Cu. Ft./Sec)	Passing Flow per Permit (Cu. Ft./Sec)
Passaic Valley Water Commission	Pompton River at Pompton Plains	92.8	136 (2)
Passaic Valley Water Commission	Passaic River at Little Falls	89.0	----
Passaic Valley Water Commission	Passaic River at Two Bridges	27.2	27.2
NJDWSC	Wanaque River	15.5	10.8 to 15.5
NJDWSC	Ramapo River	61.9	61.9
NJDWSC	Two Bridges	143.3 (1)	143.3 (1)
City of Newark	Macopin	12.3	12.3

(1) 27.2 cfs when PVWC is also diverting 75 MGD at Two Bridges.
(2) Permit 5099

The code indicates that where passing flow is not specified, it will be fixed by the Department based on an amount equal to the average daily flow for the driest month from records, or in lieu thereof, 125,000 gallons for each square mile of unappropriated watershed above the point of diversion (in addition to flows from any appropriated watershed above the point of diversion).

The code also indicates (NJAC 7:19-4.6 (d), 1) that fees will be paid by purveyors at a minimum charge of $1.00 per million gallons for each million gallons below the passing flow requirement, when the purveyor is diverting water. The maximum charge of $10.00 per million gallons shall apply on those days when the passing flow below the point of diversion is zero.

In WMA 6:

It is noted that the Passaic River and Rockaway River subwatersheds are currently used for major surface water supplies. The Clyde Potts Reservoir in the upper portion of the Whippany River subwatershed is an additional supply of surface water in WMA 6.

The following information is specific to those sources and users within the watershed:

- **Boonton Reservoir System** – The 8.1 BG **Boonton Reservoir** is owned by the City of Jersey City, and is filled by the **Rockaway River** and main tributaries (Beaver Brook, Green Pond Brook, and Stony Brook) within a drainage basin of over approximately 119 square miles. The **Splitrock Reservoir** which holds approximately 3.4 BG is part of the reservoir system. The reservoir system and watershed has a safe yield of 56.8 MGD.

- **Clyde Potts Reservoir** – This 400 million-gallon reservoir, maintained by SMCMUA, is located in Mendham Township, and is filled by a small adjacent watershed of Harmony Brook within the Whippany River watershed. This watershed and reservoir has a safe yield of 2 MGD.

- **Passaic River Basin** – The Passaic River supply is used by the New Jersey-American Water Company at their Canoe Brook Water Treatment Plant located in Millburn Township. The Water Company is permitted to divert 11 MGD from

Canoe Brook. The Passaic River diversion is limited to the months of October through May, and also by a minimum passing flow of 75 MGD.

Although the Passaic Valley Water Commission (PVWC) does not have any water intakes physically located within WMA 6, they have a main intake located in WMA 4 just downstream of the WMA 6 and WMA 3 watershed area delineations. PVWC draws approximately 50 MGD from the Passaic River Basin (only a small portion of this water is from runoff within WMA 4), and, therefore, is very dependent upon watershed planning decisions within WMA 6 and WMA 3.

Water supply is provided to WMA 6 via the WaterSource Project through which PVWC transfers finished water from its Little Falls Water Treatment Plant (in WMA 4) upstream to WMA 6. Additional supply is also provided to WMA 6 through interconnections between the New Jersey-American Water System in WMA 6 and the Elizabethtown Water Company in WMAs 7 and 9.

- **Taylortown (Stony Brook) Reservoir** – The Town of Boonton Water Department owns and operates Taylortown Reservoir. Taylortown Reservoir is located north of Boonton in Montville Township. The reservoir has a safe yield of 1.5 MGD, and the allocation is 0.7 MGD.

Evaluation of Surface Water Use for Potable Supply

Table 1.16.3 provides a summary of important statistical information for the various surface water users in WMA 6:

Table 1.16.3
Summary Statistics on Surface Water Diversion

Purveyor	Location	Safe Yield (MGD)	Allocation (MGD)	Diversion Avg. 1990-1999 (MGD)	Diversion Avg 1999 (MGD)	Reservoir Capacity (BG)	Drainage Area (sq. mi.)	Min. Passing Flow (MGD)	Interbasin Transfer (MGD)	Depletive Use (MGD)
NJAWC	Canoe Brook WTP - Passaic River	11	11	6.2	7.3	3.1	114	75	24 (1)	0
Jersey City	Boonton Reservoir System	56.8		47.8	50.9	8.1	119	7	-48	48
SMCMUA	Clyde Potts Reservoir	2.0	4	0.8	0.3	0.4	<2		+2 (2)	0
Town of Boonton	Taylortown Reservoir	1.5	0.7	0.85	0.4	0.7			0	0
	Totals	71.3		55.65	58.9				-22	

(1) Approximately 12 MGD from Elizabethtown Water Company and 12 MGD from PVWC
(2) From NJAWC, originating at NJDWSC and/or PVWC

Source: WMAs 3, 4, 6 Characterization and Assessment Studies (2002). Available at: http://www.njdwsc.com/prbwmp/intro.htm