# New Jersey Water Withdrawals, Uses, Transfers, and Discharges by HUC11, 1990 to 1999

Appendix 7: HUC11 Tables, Figures and Maps WMA 7 - Arthur Kill







NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION



WMA:			A	Arthur Kill	l i			07										
HUC11:		Newar	k Bay / Ki	ill Van Ku	ill / Upr NY	′ Bay		02	20301040	10	ľ							
											1							
Table 1. Freshwater <sup>1</sup> Withdrawals (Q)	Withdrawal	ls in the HU 1991	C11 (millio 1992	ons of gallo 1993	o <b>ns)</b> 1994	1995	1996	1997	1998	1999	average		Fig 1.	Average So	ource of	Fig 2. Ave	age Destinatio	on
urface water: 2		0	0	0	0	0	0	0	0	0	0	30.000		Fresh Wate	er	of F	resh Water	
other	0	0	0	0	0	0	0	10	17	20	5	25,000			-			
sum round-water: 3	0	0	0	0	0	0	0	10	17	20	5	20,000						
confined	0	0	0	0	0	0	0	0	0	0	0	se 0 <u>15,000</u>						
sum	20	11	11	17	15	114	134	136	154	201	81	ගී _ <u>ල</u> 10,000						
total withdrawals:	20	11	11	17	15	114	134	146	171	221	86	≣ 5,000	+					
Table 2. Freshwater I	mports To {	. Exports Fr	om the HU	IC11 (milli	ons of gallo	ns)						0		·			].	
imports <sup>11</sup>	27,726	29,075	26,493	26,431	27,601	25,226	25,932	24,377	26,581	25,318	26,476		ground	surface	imports	consump- tive	nonconsump- tive (not	exports
net	38 27,688	6 29,069	11 26,482	69 26,362	7 27,594	75 25,151	278 25,653	458 23,919	460 26,121	354 24,963	26,300		water	water		(evaporated)	evaporated)	
Table 3. Nonconsum	ptive <sup>4</sup> & Co	nsumptive <sup>5</sup>	Water Use	e <sup>6</sup> in the H	UC11, by Us	se Type (m	illions of g	allons)	1000	1000	21/27255							
otable purveyors	1990	1991	1992	1993	1994	1990	1990	1997	1990	1999	average			Figure 3. 0	Consumptive	& Nonconsumpt	ve Use	
nonconsumptive	24,870 2,818	26,092 2,977	23,868 2,614	23,716 2.647	24,749 2,845	22,607 2,544	23,080 2,573	21,338 2,582	23,458 2,663	22,409 2,554	23,619 2,682	30,000	T					]
omestic wells		2,077	-,017	_,0-11	_,0-0	2,077	_,070	_,002	_,000	_,007	2,002	25,000	+					
nonconsumptive consumptive	6 1	6 1	6 1	6 1	6 1	6 1	6 1	6 1	6 1	6 1	6 1	20 000						
dustrial & commercial & m	ining 12	4	4	٩	8	96	115	116	132	174	67	/ su	T					
consumptive	1	0	0	1	1	11	13	13	15	19	7	କୁ 15,000 ଓ	+					
gricultural & non-agricultura nonconsumptive	al irrigation 0	0	0	0	0	0	0	1	2	2	0	U0,000	+					
consumptive	0	0	0	0	0	0	0	9	15	18	4	≥ 5.000	-					
nonconsumptive	0	0	0	0	0	0	0	0	0	0	0	0,000						
consumptive SUM:	0	0	0	0	0	0	0	0	0	0	0	0	+-	dama	indu	strial &	-	
nonconsumptive	24,888	26,102	23,878	23,731	24,763	22,709	23,201	21,461	23,598	22,591	23,692		purveyors	well	ls comm	ercial & agric ning & irrig	ation gei	neration
PERCENTAGES:	2,020	2,970	2,013	2,040	2,040	2,000	2,367	2,005	2,094	2,595	2,094						1	
nonconsumptive consumptive	89.8% 10.2%	89.8% 10.2%	90.1% 9.9%	90.0% 10.0%	89.7% 10.3%	89.9% 10.1%	90.0% 10.0%	89.2% 10.8%	89.8% 10.2%	89.7% 10.3%	89.8% 10.2%						]	
· · ·																		
Table 4. Average Sea	sonal <sup>7</sup> Use	- Nonconsu	ımptive⁴ 8	Consump	tive⁵ (millio	ons of gallo	ns)											
Use Group	Wi Noncon-	nter Consump-	Sp Noncon-	oring Consump-	Surr Noncon-	nmer Consump-	F Noncon-	all Consump	Yearl Noncon-	y Avg. Consump	_	<sup>3,000</sup> T	Figure 4	4. Average	Seasonal Con	sumptive Water	Loss, by Use	
	sumptive	tive	sumptive	tive	sumptive	tive	sumptive	tive	sumptive	tive	_	ຫຼັ 2,500 -	-					
domestic wells	6,412 1	0	6,144	<u>391</u> 0	5,161 2	<u>1,787</u> 1	5,902	<u>504</u> 0	23,619	2,682	-	2,000 -	-					winter
ndustrial & commercial &	15	2	16	2	19	2	17	2	67	7	-	⊟ 1,500	-					summer
agricultural & non-	0	0	0	1	0	3	0	1	0	4	-	.000 ±	-					fall
agricultural irrig. power generation	0	0	0	0	0	0	0	0	0	0	_	≥ 000						
SUM:	6,428	2	6,162	393	5,182	1,793	5,921	507	23,692	2,694	-	p	otable	domestic	industrial	& agricultur	e power	
												pu	rveyors	wells	commercia mining	al & & irrigatio	n generatio	n
Table 5. Sewage Gen	eration & Tr	ansfers <sup>®</sup> in	the HUC1	1 (millions	of gallons)								Figure	5. Average	Sewage Gen-	Fig 6. Ave	rage Treated-E	Effluent
generated in HUC11	1990 23.294	1991 22.430	1992	1993 21.804	1994 21.953	1995 19.995	1996 22.468	1997 21.060	1998 21.483	1999	average 21.557		-	eration 8	Transfers	Disc	harge Locatio	n
imported to HUC11	89,166	88,300	81,670	85,800	86,044	79,365	88,251	83,165	84,811	80,403	84,697	120,000 -						1
	2,730	2,768	2,415	2,798	2,906	2,421	2,934	∠,648	2,712	2,587	2,692	× 80,000 -						
exported from HUC11												بة 60,000 - 100 Galor		-				
exportea from HUC11		fluont (Dee	laimed-Wa	ter) Discha	arges <sup>9</sup> in the	e HUC11 (n	nillions of	gallons)			1	40,000 -		-				
таble 6. Destination с	of Treated E	inuent (Rec		1000	100/	1995	1996	1997	1998	1999	average	≥ 20,000 -						
Table 6. Destination of destination fresh water	of Treated E 1990 0	<u>1991</u> 0	1992 0	<u>1993</u> 0	0	0	0	0	0	0	0							
Table 6. Destination of destination fresh water brackish water	of Treated E 1990 0 108,872	<u>1991</u> 0 107,814	1992 0 99,719	0 104,762	0 105,060	0 96,905	0 107,755	0 101,544	0 103,554	0 98,172	0 103,416	0 -			, <b></b> ,,	fre	sh brackish	salt

Table 7. 1999 Water Allocations<sup>10</sup> in HUC11 by Water Source Water Source surface water 18 ground water 220 total 238

Table 8. 1999 Water Allocations <sup>10</sup> in HUC11 by
Water Use Group

Table 8. 1999 Water Allocations 10	in HUC11
Water Use Group	
Use Group	MGY
agricultural	0
commercial	0
industrial	183
irrigation	55
mining	0
potable supply	0
power generation	0

Table 9.	HUC11 Desc	riptive S	tatistics
Area:			
in this Hl	JC11 only	43.6	sq. mi.
upstrean	n HUC11s	923.8	sq. mi.
total wa	atershed	967.4	sq. mi.
(this HUC11	onshore area:	31.1	sq. mi.)
Populatio	on of this HUC	211:	
Year	Population	Change	_
1940	474,088	-	
1950	477,756	0.8%	
1960	446,269	-6.6%	
1970	430,050	-3.6%	
1980	378,183	-12.1%	
1990	350,723	-7.3%	
2000	360.631	2.8%	

Table 10. Upstre	am and downs	stream HUC11s (in NJ)
location	#	name
downstream:	#N/A	#N/A
(if any)		
upstream:	02030103010	Passaic River Upr (above Pine Bk)
(if any)	02030103020	Whippany River
	02030103030	Rockaway River
	02030103040	Passaic River Upr (Pompton to Pine Bk)
	02030103050	Pequannock River
	02030103070	Wanaque River
	02030103100	Ramapo River
	02030103110	Pompton River
	02030103120	Passaic River Lower (Saddle to Pompton)
	02030103140	Saddle River
	02030103150	Passaic River Lower (Nwk Bay to Saddle)
	02030103170	Hackensack R (above Hirshfeld Brook)
	02030103180	Hackensack R (below/incl Hirshfeld Bk)

2010	383,044	6.2%	est.12
2020	412,390	7.7%	est.12
2030	437,592	6.1%	est.12
Land Use	of this HUC1	11:	
Tuno	Yea	ar	Change
туре	1986	1995	Change
ag.	0.0%	0.0%	0.0%

ag.	0.0%	0.0%	0.0%
barren	2.9%	0.5%	-2.4%
forest	4.5%	5.7%	1.3%
urban	61.3%	62.9%	1.5%
water	29.2%	29.2%	0.0%
wetlands	2.0%	1.7%	-0.4%
- % of this H	IUC11 in:		
Pinela	nds:	0.0%	
Highla	nds:	0.0%	

### NOTES:

1 Salt and brackish water withdrawal and use is not included in this data.

2 This does not account for water released from onstream reservoirs for downstream intakes.

3 Includes both permitted ground-water withdrawals and estimated domestic well withdrawals.

4 Nonconsumptive water use refers to water used in the watershed but not evaporated.

5 Consumptive water use refers to water evaporated in the watershed. It does not include exports.

6 Use refers only to water actually used in that HUC11. It is equal to freshwater withdrawals + imports - exports. 7 Winter is Jan, Feb, Dec of the same year; spring is March-May; summer is June-Aug; fall is Sept-Nov.

8 Sewage generation and transfers are based on intersection of sewer service areas with HUC11s.
 9 Based on discharge volumes reported under NJPDES program.

10 The allocated volume is calculated from allocation permits on file with the Bureau of Water Allocation, NJDEP, as of 1999. 11 Import and export volumes based on reported transfers between purveyors and on intersection of purveyor service areas with HUC11s.

12 Projected population estimates based on NJ Metropolitan Planning Organization estimates.

13 Subject to revision.

14 Withdrawals for offstream reservoirs are problematic and complicate Figures 1 and 2.





	Key for Di	scharge Da	ita			Key fo	r Witho	lrawal Data		Ì	Area of Detail
_19	999 Treated E	ffluent Disch	narge	Source		1999	Withdra	wal	Use Group		LA
	0 - 50	MGY		GW Confined		No 1999	Use	H+A	Agricultural	٠	2 Lite
	50 - 100	MGY	٠	GW Unconfined	$\bigcirc$	1 - 50	MGY		Commercial	•	5 ZE
	100 - 500	MGY	•	SW	$\bigtriangleup$	51 - 100	MGY		Industrial	•	K SCI
	> 500	MGY	<b>♦</b>			101 - 500	) MGY		Irrigation	•	E TA
Ot	ner Permittec	l Discharge							Mining	•	CHS XX
		Ŭ				> 500	MGY		Not Classified		
									Potable Supply		the start
					MGY :	= millions o	fgallons	per year	Power Generation	•	

			Water	r Withd	rawals,	Transfe	ers and	Disch	narges	for EL	IZABETI	<sup>-</sup> H RIVER 02030104020
WMA:			Α	rthur Kill				07				
HUC11:			Eliza	abeth Riv	ver			02	0301040	)20		
Table 1. Freshwater <sup>1</sup> Withdrawals (Q)	Withdrawals	<b>s in the HUC</b> 1991	<b>C11 (millio</b> 1992	ns of gallo 1993	o <b>ns)</b> 1994	1995	1996	1997	1998	1999	average	Fig 1. Average Source of Fig 2. Average Destination
face water: <sup>2</sup> Delaware River	0	0	0	0	0	0	0	0	0	0	0	Fresh Water of Fresh Water
otner sum und-water: <sup>3</sup>	0	0	0	0	0	0	0	0	0	0	0	
confined unconfined	0 1,044	0 1,688	0 1,296	0 1,405	0 1,036	0 1,252	0 1,105	0 1,154	0 989	0 1,036	0 1,200	
sum total withdrawals:	1,044	1,688 1,688	1,296 1,296	1,405 1,405	1,036	1,252 1,252	1,105	1,154 1,154	989 989	1,036	1,200	
Table 2. Freshwater I	mports To &	Exports Fre	om the HU	C11 (millio	ons of gallor	ns)						
imports <sup>11</sup> exports <sup>11</sup>	12,888 1,534	13,000 2,166	12,262 1,806	12,542 1,933	13,268 1,616	12,778 1,798	12,683 1,668	12,273 1,699	13,016 1,697	12,678 1,789	12,739 1,771	ground surface imports tive tive (not water water (evaporated) evaporated)
net	11,353	10,834	10,456	10,609	11,652	10,980	11,015	10,574	11,320	10,888	10,968	
Table 3. Nonconsum Water use	<b>ptive<sup>4</sup> &amp; Cor</b> 1990	nsumptive <sup>5</sup> 1991	Water Use 1992	6 in the H 1993	<b>UC11, by Us</b> 1994	<b>e Type (mi</b> 1995	llions of g 1996	<b>allons)</b> 1997	1998	1999	average	
ble purveyors nonconsumptive	10,706	10,848	10,175	10,307	10,923	10,528	10,439	10,078	10,768	10,449	10,522	Figure 3. Consumptive & Nonconsumptive Use
nonconsumptive	4	4	4	4	4	4	4	4	4	4	4	12,000
consumptive strial & commercial & m	1 nining 420	1	1	1	1	1	1	1	1	1	1	
consumptive consumptive cultural & non-agricultur	430 48 al irrigation	40	41	43	404 45	409 45	414 46	38	217 24	20	39	
nonconsumptive consumptive	3 30	4 40	5 41	6 54	6 58	5 46	4 40	7 64	4 37	5 41	5 45	₩ 4,000
er generation nonconsumptive consumptive	0	0	0	0	0	0	0	0	0	0	0	
SUM: nonconsumptive	11,143	11,217	10,549	10,705	11,337	10,946	10,861	10,428	10,993	10,636	10,882	potable domestic industrial & agriculture power purveyors wells mining & irrigation generation
Consumptive PERCENTAGES: nonconsumptive	1,254 89.9%	1,305	1,203	1,309 89.1%	1,350	1,287	1,259	1,300 88.9%	1,316	1,288	1,287 89.4%	
consumptive	10.1%	10.4%	10.2%	10.9%	10.6%	10.5%	10.4%	11.1%	10.7%	10.8%	10.6%	
Table 4. Average Sea	sonal <sup>7</sup> Use	- Nonconsu	mptive <sup>4</sup> &	<b>Consump</b>	tive <sup>⁵</sup> (millio	ns of gallo	ns)	əll	Vear			Figure 4. Average Seasonal Consumptive Water Loss, by Use
Use Group	Noncon- sumptive	Consump- tive	Noncon- sumptive	Consump- tive	Noncon- sumptive	Consump- tive	Noncon- sumptive	Consump- tive	Noncon- sumptive	Consump- tive		1,400
potable purveyors domestic wells	2,851 1	0	2,748 1	177 0	2,325 1	805 0	2,598 1	220 0	10,522 4	1,202 1		
mining agricultural & non-	80	9	89	10	93	10	88	10	351	39		<u> <u> </u></u>
agricultural irrig. power generation	1 0	6 0	1	10 0	2	19 0	1 0	10	5	45		
SUM:	2,933	15	2,839	197	2,421	835	2,688	240	10,882	1,287		potable domestic industrial agriculture power purveyors wells commercial a tirrigation generation
												mining
Table 5. Sewage Gen	eration & Tra 1990	ansfers <sup>®</sup> in 1991	the HUC11 1992	( <i>millions</i> 1993	<b>of gallons)</b> 1994	1995	1996	1997	1998	1999	average	Figure 5. Average Sewage Gen- Fig 6. Average Treated-Effluent eration & Transfers Discharge Location
generated in HUC11 imported to HUC11	8,668 16,428	8,843 16,657	7,800 14,535	8,913 16,836	9,218 17,490	7,796 14,571	9,353 17,654	8,452 15,935	8,690 16,322	8,263 15,566	8,600 16,199	25,000
xportea from HUC11	1,149	1,218	1,147	1,207	1,213	1,127	1,272	1,158	1,219	1,138	1,185	
Table 6. Destination (	of Treated Ef	fluent (Recl	laimed-Wat	ter) Discha	arges <sup>9</sup> in the	e HUC11 (m	illions of g	gallons)				
destination fresh water	1990 0	1991 0	1992 0	1993 0	1994 0	1995 0	1996 0	1997 0	1998 0	1999 0	average 0	
orackish water salt water	0 23,947	U 24,281	υ 21,188	U 24,542	0 25,495	0 21,241	U 25,734	U 23,229	U 23,793	U 22.691	U 23.614	fresh brackish salt

Water S	ource	_
Water Source	MGY	_
surface water	0	
ground water	2,692	
total	2,692	
Table 8. 1999 Water Allo	cations <sup>10</sup> i	n HUC11 by
Water Use	<b>O</b>	
Waler Use	e Group	
Use Group	Group	MGY
Use Group agricultural	Group	MGY 0
Use Group agricultural commercial	Group	MGY 0 0
Use Group agricultural commercial industrial	Group	MGY 0 0 607
Use Group agricultural commercial industrial irrigation	Group	MGY 0 607 84
Use Group agricultural commercial industrial irrigation mining	Group	MGY 0 607 84 0
Use Group agricultural commercial industrial irrigation mining potable supply	Group	MGY 0 607 84 0 2,000

Table 9. H	IUC11 Desc	riptive St	tatistics
Area:			
in this HU	C11 only	22.9	sq. mi.
upstream	HUC11s	0.0	sq. mi.
total wa	tershed	22.9	sq. mi.
(this HUC11 of	onshore area:	22.8	sq. mi.)
Populatio	n of this HUC	:11:	
Year	Population	Change	_
1940	219,169	-	
1950	241,635	10.3%	
1960	245,956	1.8%	
1970	245,908	0.0%	
1980	236,010	-4.0%	
1990	227,667	-3.5%	
2000	234,293	2.9%	
2010	243,779	4.0%	est.12
2020	256,471	5.2%	est.12
2030	270,564	5.5%	est.12
Land Use	of this HUC1	1:	
Type	Yea	ır	Change
Type	1986	1995	onunge
ag.	0.0%	0.0%	0.0%
barren	0.0%	0.1%	0.1%
forest	4.0%	3.7%	-0.3%
urban	93.2%	93.5%	0.3%
water	0.7%	0.7%	0.0%
wetlands	2.0%	2.0%	-0.1%
% of this	HUC11 in:		
Pinela	ands:	0.0%	
الماحدا	anda.	0.00/	

Table 10. Upstream	n and dow	nstream HUC1	1s (in NJ)	
location	#		name	-
downstream:	#N/A	#N/A		
(if any)				
upstream:				
(if any)				
,				

0

### NOTES:

Τ

1 Salt and brackish water withdrawal and use is not included in this data.

2 This does not account for water released from onstream reservoirs for downstream intakes.

3 Includes both permitted ground-water withdrawals and estimated domestic well withdrawals.

4 Nonconsumptive water use refers to water used in the watershed but not evaporated.

5 Consumptive water use refers to water evaporated in the watershed. It does not include exports.

6 Use refers only to water actually used in that HUC11. It is equal to freshwater withdrawals + imports - exports.
 7 Winter is Jan, Feb, Dec of the same year; spring is March-May; summer is June-Aug; fall is Sept-Nov.

8 Sewage generation and transfers are based on intersection of sewer service areas with HUC11s.
 9 Based on discharge volumes reported under NJPDES program.

10 The allocated volume is calculated from allocation permits on file with the Bureau of Water Allocation, NJDEP, as of 1999. 11 Import and export volumes based on reported transfers between purveyors and on intersection of purveyor service areas with HUC11s.

12 Projected population estimates based on NJ Metropolitan Planning Organization estimates.

13 Subject to revision.

14 Withdrawals for offstream reservoirs are problematic and complicate Figures 1 and 2.

irrigation mining potable supply power generation





Key for Discharge I	Data			Key for	Withd	Irawal Data		Ì	Area of Detail
1999 Treated Effluent Dis	charge	Source		1999 V	Nithdra	wal	Use Group		L AL
0 - 50 MGY	•	GW Confined		No 1999 L	Jse		Agricultural		2 Del
50 - 100 MGY	٠.	GW Unconfined	$\bigcirc$	1 - 50	MGY		Commercial	•	5 5 5 5
100 - 500 MGY	•	SW	$\bigtriangleup$	51 - 100	MGY		Industrial	•	X-ST
> 500 MGY	•			101 - 500	MGY		Irrigation	•	
Other Permitted Discharge	•						Mining		CHS SI
- Constrainte de la constraint de la constrainte de la constraint de la constraint de la constraint de la const				> 500	MGY		Not Classified		
							Potable Supply		The former of the second secon
			MGY	= millions of	gallons	per year	Power Generation	•	

WWA:				nthe con 1611				07				
			A	Inthur Kill				07			,	
HUC11:		N	lorses C	reek / Pile	es Creek			02	0301040	)30		
Table 1. Freshwater <sup>1</sup>	Withdrawal	is in the HUC	C11 (millic	ons of gallc	ons)	1005	1000	1007	4000	1000		Fig 1 Average Source of Fig 2 Average Destination
Withdrawals (Q)	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	average	Fresh Water of Fresh Water
Delaware River other	3,065	4,666	2,984	2,535	2,577	2,794	2,078	1,840	1,460	1,327	2,532	7,000
ground-water: <sup>3</sup>	3,065	4,666	2,984	2,535	2,577	2,794	2,078	1,840	1,460	1,327	2,532	
confined unconfined	0 549	0 443	0 417	0 309	0 331	0 308	0 288	0 406	0 400	0 320	0 377	9 9 4,000 7
sum total withdrawals:	549 3,614	443 5,109	417 3,401	309 2,845	<u>331</u> 2,908	308 3,102	288 2,366	406 2,246	400 1,859	320 1,646	377 2,910	z,000 +
ļ												
Table 2. Freshwater In imports <sup>11</sup>	nports To & 2,315	Exports Fro 2,327	om the HU 2,236	C11 (millio 2,410	ons of gallo 2,728	<b>ns)</b> 2,726	2,642	2,705	2,728	2,781	2,560	ground surface imports two two foot
exports <sup>11</sup> net	841 1,474	832	840	852 1,557	920 1,808	905 1,821	885 1,757	862	876 1,853	852 1,928	867 1,693	water water (evaporated)
	.,	.,	.,	.,	.,	.,	.,	.,•	.,	.,	.,	
Table 3. Nonconsump Water use	tive <sup>4</sup> & Cor	nsumptive <sup>5</sup>	Water Use	<sup>6</sup> in the H 1993	UC11, by U 1994	se Type (mi 1995	llions of g	<b>allons)</b> 1997	1998	1999	average	
potable purveyors	4.454	6.067	4 202	2.046	4 262	4 496	2 726	2 564	2 202	2 112	4 112	Figure 3. Consumptive & Nonconsumptive Use
consumptive	4,454 154	159	4,302 146	180	200	4,400	192	213	219	227	190	4,500
nonconsumptive	1	1	1	1	1	1	1	1	1	1	1	± 4,000 +
consumptive	0 ining	0	0	0	0	0	0	0	0	0	0	ğ 3,500 +
nonconsumptive consumptive	419 47	328 36	301 33	247 27	220 24	198 22	179 20	272 30	260 29	200 22	262 29	
agricultural & non-agricultura	al irrigation	1	1	0	1	1	0	1	0	1	1	
consumptive	11	12	13	0	7	9	4	8	0	9	7	≥ 1,000
nonconsumptive	3,065	4,666	2,984	2,535	2,577	2,794	2,078	1,840	1,460	1,327	2,532	
SUM:	7.041	11.062	7 590	6 720	7.061	7 494	E 095	5 6 7 9	4 024	4 642	6 000	potable domestic commercial & agriculture power
consumptive	212	207	193	208	232	236	216	251	248	259	226	purveyors wells mining & irrigation generation
nonconsumptive	97.4%	98.2%	97.5%	97.0%	96.8%	96.9%	96.5%	95.8%	95.2%	94.7%	96.8%	nonconsumptive consumptive
consumptive	2.0%	1.0%	2.5%	3.0%	3.2%	3.1%	3.3%	4.270	4.0%	0.3%	3.270	
Table 4. Average Sea	sonal <sup>7</sup> Use	- Nonconsu	mptive <sup>4</sup> &	Consump	tive⁵ (millio	ons of gallo	ns)					Finance & Austrano Scanner & Companyative Water Lang has the
Use Group	Wir Noncon-	nter Consump-	Spi Noncon-	ring Consump-	Sun Noncon-	nmer Consump-	Fa Noncon-	all Consump-	Year Noncon-	y Avg. Consump	-	
potable purveyore	sumptive 416	tive 0	sumptive 413	tive 28	sumptive 374	tive 129	sumptive 378	tive 33	sumptive 1,580	tive 190	-	∑ 150
potable pulveyuls	0	0	0	0	0	0	0	0	1	0	-	≝ 100
domestic wells		6	64	7	78	9	67	7	262	29	_	ඊ 
domestic wells industrial & commercial & mining agricultural & pop-	54			1	1	5	0	2	1	7		
domestic wells industrial & commercial & mining agricultural & non- agricultural irrig.	0		0		604	0	C 1 O	0	0 5 2 2	0	_	
domestic wells industrial & commercial & mining agricultural & non- agricultural irrig. power generation SUM:	0 682 1,152	0 0 0 6	0 580 1,056	0 36	631 1,084	0 143	640 1,085	0 42	2,532 4,377	0 226	-	
domestic wells industrial & commercial & mining agricultural & non- agricultural irrig. power generation SUM:	54 0 682 1,152	0 0 0 6	0 580 1,056	0 36	631 1,084	0 143	640 1,085	0 42	2,532 4,377	0 226	_	potable domestic commercial & agriculture power purveyors wells mining
domestic wells industrial & commercial & mining agricultural & non- agricultural irrig. power generation SUM:	54 0 682 1,152	0	0 580 1,056	0 36	631 1,084	0 143	640 1,085	0 42	2,532 4,377	0 226	-	potable domestic industrial & agriculture power purveyors wells mining
domestic wells industrial & commercial & mining agricultural & non- agricultural irrig. power generation SUM:	54 0 682 1,152	0 0 6	0 580 1,056	0 36	<u>631</u> 1,084	0 143	640 1,085	0 42	2,532 4,377	0 226	-	potable domestic industrial & agriculture power purveyors wells mining & irrigation generation
domestic wells industrial & commercial & mining agricultural & non- agricultural irrig. power generation SUM:	0 682 1,152	0 0 6 ansfers <sup>8</sup> in t	0 580 1,056	0 36	631 1,084 of gallons)	0 143	640 1,085	0 42	2,532 4,377	0 226	- -	Figure 5. Average Sewage Gen-
domestic wells industrial & commercial & mining agricultural & non- agricultural irrig. power generation SUM: Table 5. Sewage Gene generated in HUC11	54 0 682 1,152 27ation & Tra 1990 1,879	0 0 6 ansfers <sup>®</sup> in a 1991 3,880	0 580 1,056 the HUC11 1992 3,791	1 0 36 1 (millions 1993 4,003	631 1,084 <b>of gallons)</b> 1994 4,079	0 143 1995 3,873	640 1,085 1996 4,569	0 42 1997 3,614	2,532 4,377 1998 4,321	0 226 1999 3,782	average 3,779	Figure 5. Average Sewage Generation & Transfers 4,000 4,000 4,000 4,000 4,000 4,000 4,000 4,000 4,000
domestic wells     industrial & commercial &         mining         agricultural & non-         agricultural irrig.         power generation         SUM:	54 0 682 1,152 3ration & Tra 1990 1,879 0 1,879	0 0 6 ansfers <sup>8</sup> in 1 1991 3,880 0 3,880	0 580 1,056 the HUC11 1992 3,791 0 3,791	1 0 36 1993 4,003 0 4,003	631 1,084 0f gallons) 1994 4,079 0 4,079	0 143 1995 3,873 0 3,873	640 1,085 1996 4,569 0 4,569	0 42 1997 3,614 0 3,614	2,532 4,377 1998 4,321 0 4,321	0 226 1999 3,782 0 3,782	average 3,779 0 3,779	Figure 5. Average Sewage Generation & Transfers Figure 5. Average Sewage Generation & Transfers Figure 5. Average Sewage Generation & Transfers
consistic wells         industrial & commercial &         mining         agricultural & non-         agricultural irrig.         power generation         SUM:	54 0 682 1,152 9ration & Tra 1990 1,879 0 1,879	0 0 6 ansfers <sup>8</sup> in 1 1991 3,880 0 3,880	0 580 1,056 the HUC11 1992 3,791 0 3,791	1 0 36 1 (millions 1993 4,003 0 4,003	631 1,084 <b>of gallons)</b> 1994 4,079 0 4,079	0 143 1995 3,873 0 3,873	640 1,085 1996 4,569 0 4,569	0 42 <u>1997</u> 3,614 0 3,614	2,532 4,377 1998 4,321 0 4,321	0 226 1999 3,782 0 3,782	average 3,779 0 3,779	Figure 5. Average Sewage Generation & Transfers Figure 5. Average Sewage Generation & Transfers Figure 5. Average Sewage Generation & Transfers Fig 6. Average Treated-Effluent Discharge Location
domestic wells     industrial & commercial &         mining         agricultural & non-         agricultural irrig.         power generation         SUM:	54 0 682 1,152 9ration & Tr. 1990 1,879 0 1,879 0	0 0 6 ansfers <sup>®</sup> in 1 1991 3,880 0 3,880	0 580 1,056 the HUC11 1992 3,791 0 3,791 0 3,791	1 (millions 1993 4,003 0 4,003 1003	631 1,084 0f gallons) 1994 4,079 0 4,079	0 143 <u>1995</u> 3,873 0 3,873	640 1,085 1996 4,569 0 4,569	0 42 <u>1997</u> <u>3,614</u> 0 <u>3,614</u>	2,532 4,377 4,377 4,321 0 4,321	0 226 1999 3,782 0 3,782	average 3,779 0 3,779	Figure 5. Average Sewage Generation & Transfers
Table 5. Sewage Generated in HUC11         imported to HUC11         imported from HUC11	54 0 682 1,152 9ration & Tro 1990 1,879 0 1,879 0 1,879 0 1,879	0 0 6 ansfers <sup>8</sup> in ( 1991 3,880 0 3,880 ffluent (Reck 1991	0 580 1,056 the HUC11 1992 3,791 0 3,791 aimed-Wat 1992	1 0 36 1993 4,003 4,003 ter) Discha 1993	631 1,084 of gallons) 1994 4,079 0 4,079 arges <sup>9</sup> in th 1994	0 143 1995 3,873 0 3,873 0 3,873 e HUC11 (m 1995	640 1,085 1996 4,569 0 4,569 1996	0 42 3,614 0 3,614 gallons) 1997	2,532 4,377 1998 4,321 0 4,321 1998	0 226 1999 3,782 0 3,782 1999	average 3,779 0 3,779 average	Figure 5. Average Sewage Generation & Fig 6. Average Treated-Effluent Discharge Location
contact put refyors     domestic wells     industrial & commercial &         mining     agricultural & non-     agricultural irrig.     power generation     SUM:     SUM:     Table 5. Sewage Gener generated in HUC11 imported to HUC11 exported from HUC11 exported from HUC11 Table 6. Destination o     destination     fresh water     brackish water	54 0 682 1,152 9ration & Tr. 1990 1,879 0 1,879 0 1,879 0 1,879 0 0 0 0 0	0 0 6 ansfers <sup>8</sup> in 1991 3,880 0 3,880 0 3,880 0 3,880 0 0 3,880 0 0 3,880 0 0 0 0 0 0	0 580 1,056 the HUC11 1992 3,791 0 3,791 0 3,791 0 3,791 0 3,791 0 0 0 0	1 0 36 1993 4,003 0 4,003 0 4,003 0 4,003	631 1,084 0f gallons) 1994 4,079 0 4,079 0 4,079 arges <sup>9</sup> in th 1994 0 0	0 143 143 3,873 0 3,873 0 3,873 0 3,873 0 3,873 0 995 0 0	640 1,085 1996 4,569 0 4,569 1996 0 1996 0 0	0 42 1997 3,614 0 3,614 0 3,614 1997 0 0	2,532 4,377 4,377 4,321 0 4,321 1998 0 0	0 226 1999 3,782 0 3,782 0 3,782 1999 0 0	average 3,779 0 3,779 0 3,779	Figure 5. Average Sewage Generation & Fig 6. Average Treated-Effluent Discharge Location

	rations "	in HUC11 by	
Water S	ouroo	III IIOO I I Dy	Table
Water S	ource	_	_
Water Source	MGY	_	Area
surface water	3,060		in this
ground water	590		upstre
total	3,650		tota
Table 8. 1999 Water Allo	cations <sup>10</sup>	in HUC11 by	(this HUC
14/- / 1/-		-	
Water Use	e Group	-	Popul
Use Group	e Group	MGY	Popul Year
Use Group agricultural	e Group	MGY 0	<b>Popul</b> Year 1940
Use Group agricultural commercial	e Group	MGY 0 0	Popul Year 1940 1950
Use Group agricultural commercial industrial	e Group	MGY 0 0 487	Popul Year 1940 1950 1960
Use Group agricultural commercial industrial irrigation	e Group	MGY 0 0 487 37	Popul Year 1940 1950 1960 1970
Use Group agricultural commercial industrial irrigation mining	e Group	MGY 0 0 487 37 0	Popul Year 1940 1950 1960 1970 1980



Table 10. Upstrear	n and dow	nstream HUC11s (in NJ)	
location	#	name	
downstream:	#N/A	#N/A	
(if any)			
upstream:			
(if any)			

3,060

2010	65,764	3.0%	est
2020	70,054	6.5%	est.12
2030	74,182	5.9%	est.12

## - Land Use of this HUC11:

Typo	Ye	ar	Change
Type	1986	1995	Change
ag.	0.0%	0.0%	0.0%
barren	0.5%	0.5%	0.1%
forest	5.9%	5.5%	-0.4%
urban	86.6%	86.9%	0.4%
water	3.5%	3.7%	0.2%
wetlands	3.5%	3.4%	-0.2%
% of this H	IUC11 in:		
Pinela	nds:	0.0%	
Highla	nds:	0.0%	

### NOTES:

1 Salt and brackish water withdrawal and use is not included in this data.

2 This does not account for water released from onstream reservoirs for downstream intakes.

3 Includes both permitted ground-water withdrawals and estimated domestic well withdrawals.

4 Nonconsumptive water use refers to water used in the watershed but not evaporated.

5 Consumptive water use refers to water evaporated in the watershed. It does not include exports.

6 Use refers only to water actually used in that HUC11. It is equal to freshwater withdrawals + imports - exports. 7 Winter is Jan, Feb, Dec of the same year; spring is March-May; summer is June-Aug; fall is Sept-Nov.

8 Sewage generation and transfers are based on intersection of sewer service areas with HUC11s.
 9 Based on discharge volumes reported under NJPDES program.

10 The allocated volume is calculated from allocation permits on file with the Bureau of Water Allocation, NJDEP, as of 1999. 11 Import and export volumes based on reported transfers between purveyors and on intersection of purveyor service areas with HUC11s.

12 Projected population estimates based on NJ Metropolitan Planning Organization estimates.

13 Subject to revision.

14 Withdrawals for offstream reservoirs are problematic and complicate Figures 1 and 2.

potable supply power generation





Key for Discharge Data		Key for Withdrawal Data	) I	Area of Detail
1999 Treated Effluent Discharge	Source	1999 Withdrawal	Use Group	KAD
0-50 MGY •	GW Confined	No 1999 Use ■●▲	Agricultural 🛛 😑	32 Dd
50 - 100 MGY 🔶	GW Unconfined $\bigcirc$	1-50 MGY ■●▲	Commercial 🛛 🔴	5122
100 - 500 MGY 🔶	SW $ riangle$	51-100 MGY ■●▲	Industrial 🛛 🔴	XXX
> 500 MGY 🔶		101 - 500 MGY	Irrigation 🥚	A Tra
Other Permitted Discharge 🖕			Mining 📃 🔵	CHS 33
		> 500 MGY	Not Classified 🛛 🔍 🌑	
			Potable Supply 🛛 🔵	the for
	MG	GY = millions of gallons per year	Power Generation	

WINA:			А	rthur Kill	I			07				
HUC11:		Rah	way Rive	r / Woodł	oridge Cree	ek		02	0301040	)50		
Table 1. Freshwater <sup>1</sup>	Withdrawa	ls in the HU	C11 (millio	ons of gallo	ons)							
Withdrawals (Q)	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	average	Fig 1. Average Source of Fig 2. Average Destination Fresh Water of Fresh Water
Delaware River other	0 1,925	0 1,941	0 1,858	0 1,908	0 1,971	0 1,918	0 1,946	0 1,767	0 1,662	0 1,703	0 1,860	
round-water: <sup>3</sup>	1,925	1,941	1,858	1,908	1,971	1,918	1,946	1,767	1,662	1,703	1,860	20,000 +
unconfined	4,147	4,172	4,325	3,971 3,974	4,422	3,800 3,804	3,454 3,458	4,061	3,063	<u>3,020</u>	3,843 3,849	- <u>0</u> 15,000
total withdrawals:	6,084	6,126	6,187	5,882	6,398	5,722	5,405	5,832	4,730	4,726	5,709	
Table 2. Freshwater I	mports To	& Exports Fr	om the HU	C11 (milli	ons of gallor	1s)						
imports <sup>11</sup> exports <sup>11</sup>	24,206 8,797	24,624 9,286	24,436 9,817	26,831 10,199	27,754 10,315	28,168 10,599	26,330 10,189	26,757 10,777	27,258 10,207	27,928 9,921	26,429 10,011	ground surface imports tive tive (not water water (evenorstad) evenorsted)
net	15,409	15,338	14,619	16,633	17,440	17,569	16,142	15,980	17,051	18,008	16,419	- (evapulated) evapulated)
Table 2 Nonconsum	ntivo <sup>4</sup> 8 Co	ncumptivo <sup>5</sup>	Water Us	<sup>6</sup> in the H			illions of a	allonc)				
Water use	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	average	_
otable purveyors nonconsumptive	18,841	18,682	18,220	19,511	20,837	20,368	18,870	19,005	18,937	19,767	19,304	Figure 3. Consumptive & Nonconsumptive Use
consumptive	2,091	2,183	2,060	2,447	2,434	2,420	2,210	2,294	2,383	2,497	2,302	
nonconsumptive	11	11	11	11	11	11	12	12	12	12	11	20,000
consumptive	2 Dinina	2	2	2	2	2	2	2	2	2	2	
nonconsumptive	433	407	366	318	380	317	326	320	263	236	336	
consumptive pricultural & non-agricultur	51 al irrigation	52	44	40	47	39	39	40	36	31	42	ទី ទ 10,000 –
nonconsumptive	6 58	13 115	10 94	19 168	13 114	14 121	9 80	13 114	14 130	16 141	13 114	
ower generation	50	115	54	100	114	121	00	114	130	141	114	5,000
nonconsumptive consumptive	0	0	0	0	0	0	0	0	0	0	0	
SUM:												industrial & potable domestic commercial & agriculture power
nonconsumptive consumptive	19,291 2,202	19,112 2,352	18,607 2,199	19,858 2,657	21,241 2,597	20,709 2,582	19,216 2,330	19,349 2,450	19,226 2,550	20,031 2,670	19,664 2,459	purveyors wells mining & irrigation generation
PERCENTAGES:	89.8%	89.0%	89.4%	88.2%	89.1%	88.9%	89.2%	88.8%	88.3%	88.2%	88.9%	nonconsumptive consumptive
consumptive	10.2%	11.0%	10.6%	11.8%	10.9%	11.1%	10.8%	11.2%	11.7%	11.8%	11.1%	
Table 4. Average Sea	sonal <sup>7</sup> Use	- Nonconsı	mptive <sup>4</sup> &	Consum	tive⁵ (millio	ns of gallo	ns)					
	W	nter	Sp	ring	Sum	mer	F	all	Year	ly Avg.		Figure 4. Average Seasonal Consumptive Water Loss, by Use
Use Group	Noncon- sumptive	Consump- tive	Noncon- sumptive	Consump- tive	Noncon- sumptive	Consump- tive	Noncon- sumptive	Consump- tive	Noncon- sumptive	Consump tive		۶ 2,000
potable purveyors	5,066	0	4,954	330	4,510	1,562	4,779	410	19,309	2,302	-	\$ 1500
ndustrial & commercial &	73	8	83	9	93	15	87	10	336	42	-	s 1,000
mining agricultural & non-			00						40		-	
agricultural irrig.	0	1	2	16	8	74	2	22	13	114	_	
SUM:	5,141	9	5,042	355	4,614	1,652	4,872	443	19,669	2,459	_	
												porable domestic including a griculture power purveyors wells commercial & & irrigation generation
												purveyors wells commercial & & irrigation generation mining
		ansfers <sup>8</sup> in	the HUC11	1 (millions	of gallons)							Figure 5, Average Sewage Gen- Fig 6 Average Treated-Effluent
Table 5. Sewage Gen	eration & T		1992	1993	1994	1995	1996	1997	1998	1999	average	eration & Transfers Discharge Location
Table 5. Sewage Gen	eration & T	21 985	2 I . N . I	24,120	8,758	7,744	10,802	9,100	8,635	10,860	7,822	25,000
Table 5. Sewage Gen generated in HUC11 imported to HUC11	eration & T 1990 24,045 1,812	1991 21,985 5,276	7,094	8,134			10 150	11 055	12,234	11,567	11,923	
Table 5. Sewage Gen generated in HUC11 imported to HUC11 exported from HUC11	eration & T 1990 24,045 1,812 11,215	1991 21,985 5,276 11,799	7,094 10,932	8,134 12,469	12,900	11,004	13,150	11,900				
Table 5. Sewage Gen generated in HUC11 imported to HUC11 exported from HUC11	eration & T 1990 24,045 1,812 11,215	1991 21,985 5,276 11,799	7,094 10,932	8,134 12,469	12,900	11,004	13,150	11,955				
Table 5. Sewage Gen generated in HUC11 imported to HUC11 exported from HUC11 Table 6. Destination of	eration & T. 1990 24,045 1,812 11,215	1991 21,985 5,276 11,799 <i>ffluent (Rec</i>	7,094 10,932	8,134 12,469 ter) Discha	12,900 arges <sup>®</sup> in the	11,004 HUC11 (n	nillions of	gallons)				
Table 5. Sewage Gen generated in HUC11 imported to HUC11 exported from HUC11 Table 6. Destination of destination freeb water	eration & T. 1990 24,045 1,812 11,215 of Treated E 1990 0	1991 21,985 5,276 11,799 <i>ffluent (Rec</i> 1991	7,094 10,932 <i>laimed-Wa</i> 1992	8,134 12,469 <b>ter) Discha</b> 1993	12,900 arges <sup>®</sup> in the 1994	11,004 • HUC11 (n 1995	nillions of 1996	gallons)	1998	1999	average	
Table 5. Sewage Gen generated in HUC11 imported to HUC11 exported from HUC11 Table 6. Destination destination fresh water brackish water	eration & T. 1990 24,045 1,812 11,215 of Treated E 1990 0 1,408	1991 21,985 5,276 11,799 <i>ffluent (Rec.</i> 1991 0 6,280	7,094 10,932 laimed-Wa 1992 0 8,271	8,134 12,469 <i>ter) Discha</i> 1993 0 9,391	12,900 arges <sup>9</sup> in the 1994 0 10,091	11,004 <b>HUC11 (n</b> 1995 0 9,020	nillions of 1996 0 12,444	<b>gallons)</b> 1997 0 10,335	1998 0 10,021	1999 0 12,347	average 0 8,961	

Table 7. 1999 Wate	er Allo	cations	IN HUC11 by
W	ater S	Source	_
Water Source		MGY	
surface water		1,503	_
ground water		5,600	_
	total	7,103	

....

7 4000 14/-

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Table 8. 1999 Water Allocations <sup>10</sup>	in HUC11 by
Water Use Group	
Use Group	MGY
agricultural	0
commercial	42
industrial	505
irrigation	393
mining	0
potable supply	6,162
power generation	0

Table 9. I	HUC11 Desc	riptive St	tatistics
Area:			
in this Hl	JC11 only	101.1	sq. mi.
upstream	n HUC11s	0.0	sq. mi.
total wa	atershed	101.1	sq. mi.
(this HUC11	onshore area:	99.1	sq. mi.)
Populatio	on of this HUC	211:	
Year	Population	Change	-
1940	217,418	-	
1950	267,812	23.2%	
1960	386,322	44.3%	
1970	433,442	12.2%	
1980	399,867	-7.7%	
1990	396,781	-0.8%	
2000	421,624	6.3%	
2010	438,943	4.1%	est.12
2020	466,346	6.2%	est.12
2030	488,721	4.8%	est.12

location	#		name	
downstream: (if any)	#N/A	#N/A		
upstream:				
(if any)				

# -- Land Use of this HUC11:

Turne	Ye	Change						
туре	1986	1995	Change					
ag.	0.3%	0.1%	-0.1%					
barren	0.6%	0.6%	0.0% -0.5%					
forest	12.3%	11.8%						
urban	77.3%	78.2%	0.9% 0.0% -0.3%					
water	3.0%	3.0%						
wetlands	6.5%	6.2%						
% of this HUC11 in:								
Pinela	nds:	0.0%						
Highla	nds:	0.0%						

### NOTES:

1 Salt and brackish water withdrawal and use is not included in this data.

2 This does not account for water released from onstream reservoirs for downstream intakes.

3 Includes both permitted ground-water withdrawals and estimated domestic well withdrawals.

4 Nonconsumptive water use refers to water used in the watershed but not evaporated.

5 Consumptive water use refers to water evaporated in the watershed. It does not include exports.

6 Use refers only to water actually used or by the equation in the decision in the decision of the most set of the set

8 Sewage generation and transfers are based on intersection of sewer service areas with HUC11s.
 9 Based on discharge volumes reported under NJPDES program.

10 The allocated volume is calculated from allocation permits on file with the Bureau of Water Allocation, NJDEP, as of 1999. 11 Import and export volumes based on reported transfers between purveyors and on intersection of purveyor service areas with HUC11s.

12 Projected population estimates based on NJ Metropolitan Planning Organization estimates.

13 Subject to revision.

14 Withdrawals for offstream reservoirs are problematic and complicate Figures 1 and 2.





Key for Discharge Data			ita	Key for Withdrawal Data					Ì	Area of Detail	
1999 Treated Effluent Discharge			Source 1999 Withdrawal		Use Group		LA				
	0 - 50	MGY	•	GW Confined		No 1999	Use	<b>H</b> ØA	Agricultural		2 Lited
	50 - 100	MGY	٠	GW Unconfined	$\bigcirc$	1 - 50	MGY		Commercial	•	Stat.
	100 - 500	MGY	•	SW	$\bigtriangleup$	51 - 100	MGY		Industrial	•	4507
	> 500	MGY	•			101 - 500	) MGY		Irrigation	•	6 Try
Oth	ner Permittec	l Discharge				101 000			Mining		CR221
		J				> 500	MGY		Not Classified		
									Potable Supply		the start
				MGY = millions of gallons per year <b>Power Generation</b>			•				