

1. Massachusetts Water-Use Data Status

The Massachusetts Department of Environmental Protection (MassDEP) is Massachusetts' leader of water-use data collection and data management. The agency collects water withdrawal and wastewater discharge data from municipalities, farms, cranberry operations, golf courses, and commercial and industrial businesses. The water-use data are organized into several databases, including the Water Management Act (WMA), Residential Gallons per Capita Day/Unaccounted-for-Water (RGCPD/UAW), Ground Water (GW), electronic Annual Statistical Report (ASR), and Water Quality Testing System (WQTS) databases. MassDEP also has access to EPA's National Pollutant Discharge Elimination System (NPDES) database.

Table 1 summarizes the status of water-use data collection in Massachusetts. Martha Nielsen of USGS's Maine office prepared the table for all New England states to complete. It outlines the baseline goals identified by the USGS and mirrors the baseline standards table in the Water Use Data and Research (WUDR) Program Guidance that was distributed to states in July of 2015. As the table indicates, other agencies in the state also collect relevant data. MassDEP's collaboration with those agencies is discussed in Section 2.

Table 2 summarizes Massachusetts' water-use data collection history and current databases. Data collection efforts can be broken down in to the following categories:

- **PWS Withdrawals:** Public water supply (PWS) withdrawals are reported to MassDEP pursuant to 310 CMR 22.15 and 310 CMR 36.00. The Drinking Water Program collects withdrawal data in Annual Statistical Reports (ASRs). Annual reporting records date back to 1947. The first year of withdrawal volume reporting is uncertain. A review of microfilm records revealed withdrawal reporting in the mid-1960s; however, PWS withdrawal volume data likely was not consistently reported until 310 CMR 22.15 was promulgated, which is believed to be in the late 1970s or early 1980s. Beginning in 2009, public water suppliers began submitting ASRs online via MassDEP's eDEP program. ASR data are stored and accessed through the Drinking Water Program's Water Quality Testing System (WQTS) database. The public may obtain ASRs by request. PWSs report monthly and annual withdrawal volumes for each groundwater, surface water and purchased water source.
- **All Withdrawals Exceeding 0.1 MGD:** All consumptive withdrawals (PWS, industrial, commercial, golf irrigation, crop irrigation, etc.) exceeding 0.1 million gallons per day (MGD) are regulated under the Water Management Act (MGL c.21G). The WMA program regulates withdrawals according to 28 major basins defined by the Massachusetts Water Resources Commission. Pursuant to 310 CMR 36.00, WMA-regulated entities submit annual reports of monthly and annual withdrawal volumes for each groundwater and surface water source. PWSs regulated by the WMA program (those using more than 0.1 MGD) electronically report withdrawal volumes on the ASR, whereas non-PWS entities annually submit paper reports. As noted above, the PWS ASR data are stored and accessed through WQTS. Both PWS and non-PWS data are stored in databases specific to the WMA program. These include the WMA Database, eASR, and RGPCD/UAW databases. The public is able to access certain WMA data through two tools: an Access-based WMA Permitting Tool and an online Sustainable Water Management Initiative (SWMI) Interactive GIS Map. Both are

accessible online (<http://www.mass.gov/eea/agencies/massdep/water/watersheds/sustainable-water-management-initiative-swmi.html>).

- **Self-Supplied Domestic Withdrawals:** Information on the distribution of and withdrawals from domestic wells is limited in Massachusetts. The available information primarily relates to domestic well locations. MassDEP's Well Drillers Program maintains a database of well drillers' logs dating back to the 1960s, and those logs typically indicate the water use type, such as domestic or irrigation. Drillers are required to submit logs to DEP pursuant to 310 CMR 46.00. Reporting became electronic (via eDEP) in 2010. The program was initially run by MassDCR and was taken over by DEP in 2009. Wells within the database can be mapped (via a publically-accessible program known as Search Well) to at least partially identify areas where domestic wells are used in lieu of a PWS system.

Additionally, the Drinking Water Program is working on a PWS Infrastructure Mapping Project that will improve estimates of PWS service areas and, indirectly, domestic well areas. It consists of identifying and combining historical water utility (both drinking water and wastewater) mapping initiatives, review of infrastructure information publicly available online, statewide internal inventory of water utility map formats and status, and development of a tool for MassDEP staff to utilize in accessing this information. Combined, this information will ultimately be used to develop a consistently formatted statewide water utility infrastructure map.

To categorize streamflow in Massachusetts subbasins, the WMA Program uses domestic well data from the USGS "Mass. Indicators" report (SIR 2009-5272) to estimate the volume of groundwater pumped from private wells. USGS used U.S. Census data to develop the private well use volumes.

- **Groundwater Discharges:** DEP's Ground Water Discharge Program regulates the discharge of wastewater to the subsurface for volumes exceeding 10,000 gallons per day pursuant to 314 CMR 5.00. Reporting requirements vary by permit, but most permittees submit monthly reports that include discharge volumes. Data collection began in 1983 and electronic reporting began in 2004. Electronic reporting is voluntary but will be mandatory one year after promulgation of 314 CMR 5.00 revisions, which is anticipated for early 2017. Data are stored in MassDEP's Ground Water Database, and information is provided to the public upon request.
- **Surface-water Discharges:** The NPDES Program is jointly run by MassDEP and EPA. Surface-water discharge data are reported pursuant to 314 CMR 3.00 and 40 CFR Part 122. Typically a 12-month rolling average, monthly average, and maximum daily flow volumes are reported. NPDES reporting in Massachusetts began in the mid-1970s and electronic reporting began in 2010 and will be mandatory as of December 21, 2016. Data are submitted electronically via the EPA's netDMR program. Some data can be publically accessed via the EPA's ECHO database.

Entities that reuse wastewater may be regulated by 314 CMR 20.00 (first promulgated in 2009) unless the entity holds a Ground Water Discharge Permit, in which case the reuse is regulated under 314 CMR 5.00.

- **Interbasin Transfers:** Transfers between Massachusetts' 28 major basins have been evaluated and approved pursuant to the Interbasin Transfer Act (ITA) since 1984. The ITA is administered by the Massachusetts Water Resources Commission, and DCR maintains all ITA decision records. Each approved transfer record indicates the transfer capacity rather than actual volume transferred, and volumes are not tracked over time. About 52 decisions have been made to date, including wastewater transfers. Intra-municipal transfers are exempt from ITA regulation. Transfers occurring prior to the ITA (such as the large Massachusetts Water Resources Authority (MWRA) transfers) were grandfathered in; however, MWRA's ASRs do indicate withdrawal volumes in each of their source basins, and they report the volume of water sold annually to each of their municipal customers. This is true of municipal sellers' ASRs, too. MassDCR provides a record of decisions within the past seven years online (<http://www.mass.gov/eea/agencies/dcr/water-res-protection/interbasin-transfer-act/objectives-and-accomplishments.html>).

To date, MassDEP's data sharing with USGS typically involves database queries to extract information that is output to Access or Excel files. We have performed limited QA/QC on those data. In many cases, we also summarize information via email. The data-sharing occurs on an as-needed, as-requested basis, usually for specific projects. Establishing regularly scheduled data-sharing procedures with USGS would be a data priority if MassDEP receives FY17 WUDR program funding.

2. Intra- and Inter-agency Collaboration

MassDEP's WMA Program collaborated with several other MassDEP programs as part of the workplan development; they included the Drinking Water, Well Drillers, and wastewater permitting programs.

In addition, MassDEP reached out to several state, regional, and federal organizations to inventory water-use data collection efforts in Massachusetts. Those organizations included the Department of Agricultural Resources (MassDAR), the Department of Conservation and Recreation (MassDCR), the Department of Fish and Game (MassDFG), the Department of Public Health (MassDPH), the Department of Public Utilities (DPU), the Massachusetts Area Planning Council (MAPC), the Massachusetts Water Resources Authority (MWRA), the Massachusetts office of the Natural Resources Conservation Service (NRCS), the U.S. Environmental Protection Agency (EPA), and the Massachusetts Water Resources Commission. Lastly, MassDEP collaborated with staff in the USGS's Massachusetts and Maine offices to identify data priorities and methods of improving data collection and data sharing.

Table 3 summarizes the intra- and inter-agency collaboration that was involved with the WUDR workplan development. Interagency correspondence was via email and phone and was primarily aimed at determining the types and availability of data collected. Intra-agency and USGS correspondence was via email, phone, and in-person meetings, and it focused on data gaps and priorities in addition to data types and availability.

3. Water-Use Data Priorities

Table 4 summarizes Massachusetts' priorities for improving water-use data collection and management. The table lists the state's current data limitations and steps to improve upon those limitations. Key priorities include the following:

- Converting paper-only data to electronic format – To date, MassDEP's WMA and wastewater programs receive some withdrawal reports in paper format only. Converting to an electronic reporting system would benefit these programs because it would enable MassDEP to store the data in formats that allow for statistical analysis. Manually inputting the data from paper reports is impractical and cost-prohibitive. Electronic reporting would also facilitate electronic QA/QC procedures that will improve the quality of the data as it is submitted.
- Establishing consistent water withdrawal and discharge site identifiers – The non-PWS entities regulated by the WMA program (golf courses, industries, agriculture, etc.) do not have unique identifiers for each of their groundwater and surface-water sources. Establishing unique identifiers for each source will enable electronic reporting, allow geocoding for location, and improve ease of data analysis. For example, there are likely hundreds of wells named "Well #1", "Well No.1", "Well 1", etc. Without unique identifiers, electronic reporting, data storage and analysis of the reported volumes pumped from wells with these similar or identical names is problematic, if not impossible.
- Reducing PWS reporting errors through improved database QA/QC – The electronic ASR for PWSs first used for the first reporting year (2009) included many errors and omissions due in part to insufficient data validation. Improved electronic data validation starting in 2010 has improved the quality of the data and reduced data omissions, but more electronic validation would result in higher quality of water withdrawal volume data. Such an improvement would enhance the results of statistical analysis of the data.
- Improving estimates of private (i.e. domestic) well water use – MassDEP currently uses USGS-developed estimates of private well and septic system use based on U.S. census data from 1990 and 2000. The U.S. census no longer collects private well and septic system data; therefore, new estimates will require another method. The approaches outlined in Table 4 would result in updated estimates that could be used for planning, permitting and watershed management by MassDEP and other state and federal agencies.

4. Match of In-Kind Services

MassDEP intends to apply for FY17 WUDR Program funding. As part of its WUDR efforts, MassDEP plans to provide the following in-kind services:

- electronic formatting of non-PWS data (currently underway);
- intern support for PWS and sewer mapping;
- intern support for private well research (resources pending); and
- coverage of in-state travel to all WUDR meetings.

Table 1. Status of Massachusetts Water Use Data Collection and Reporting

Note: orange cells denote data currently available in paper form only. Red cells denote unavailable data.			
Data Baseline Standards:			
PUBLIC SUPPLY			
Minimum reporting withdrawal:		N/A; any entity serving more than 25 people per day must report withdrawal data to the MassDEP Drinking Water Program	
State agency (or agencies) responsible for collecting information:		MassDEP	
		Check if "Yes":	Comments (optional):
Tier "0"	Annual withdrawals reported by system	X	
	Withdrawals reported by source (GW/SW)	X	
	Withdrawals reported by well, intake, or wellfield	X	
	Deliveries to domestic users not quantified		Deliveries are quantified
	Population served not quantified		Population served is quantified
Tier 1	Monthly withdrawals reported by system	X	
	Monthly withdrawals reported by source (GW/SW)	X	
	Deliveries to domestic users reported	X	
	Total Population served reported	X	
	GW withdrawals by aquifer designation	X*	*The electronic annual submittal form has a "well type" field that provides an indication of the aquifer type; however, it does not explicitly list the aquifer type. The well types include gravel-packed, bedrock, hand-dug, horizontal, rainy, tubular, and spring. All types but bedrock are typically completed in unconsolidated material, so this "well type" data could be used to categorize groundwater sources into sand & gravel vs. bedrock aquifers. (Springs are a mix of bedrock and unconsolidated material, but we have a separate record of their aquifer types).
Tier 2	Site-specific annual withdrawals (by intake, well, or well field)	X	
	Site-specific monthly withdrawals (by intake, well, or well field)	X	
	Population served reported by municipality or other local unit	X	
	Withdrawals reported by water source (GW/SW) and type (Fresh/Saline)	X*	*DEP primarily regulates fresh-water use only, so fresh vs. saline is not distinguished.
	Quantity of water purchased between systems	X	
	Source of purchased water (GW, SW)	X	
	Quantity of water sold between systems	X	

Table 1.

	Reporting of deliveries to domestic, commercial, industrial, thermoelectric, and other uses	X	
Tier 3	Interbasin transfers reported	X*	*Transfers between Massachusetts' 28 major basins have been tracked via the Interbasin Transfer Act (ITA) since 1984. The ITA is administered by the MA Water Resources Commission, and DCR maintains all ITA decision records. Each approved transfer record indicates the transfer <u>capacity</u> rather than actual volume transferred, and volumes are not tracked over time. About 52 decisions have been made to date, including wastewater transfers. Intra-town and intra-city transfers are exempt from ITA regulation. Transfers occurring prior to the ITA (such as the large MWRA transfers) were grandfathered in; however, MWRA's ASRs do indicate withdrawal volumes in each of their source basins, and they report the volume of water sold annually to each of their municipal customers. This is true of municipal sellers' ASRs, too.
	Internal, non-revenue uses and losses reported	X	
	Estimates of population served by site		Only applicable to systems with a single source (given that only the system-wide population served is reported in an ASR)
	Use of reclaimed wastewater for public/landscape irrigation	X*	*See "Wastewater Treatment" category below. A small number of Mass facilities use reclaimed wastewater. Our Wastewater staff report that it is rare due to onerous regulations. We do regulate reclaimed wastewater under 314 CMR 20.00 (including facilities without a discharge permit), and those facilities are tracked in one of our databases. However, facilities that reuse wastewater AND discharge to groundwater are regulated under 314 CMR 5.00 and are NOT tracked in the database.
Extra	GIS coverage of PWS service areas	X*	*We have a shapefile of PWS source points, and partial coverage of the distribution lines. MassDEP's Drinking Water Program began an inventory of distribution lines in May 2016, and they hope to finish by January 2017 if they are able to procure interns.

Table 1.

SELF-SUPPLIED DOMESTIC			
Tier "0"	Use of 1990 census to estimate self-supplied populations	X	MassDEP received the estimates from USGS for the MWI study. 2000 estimates were made using the 1990 census tract percentages due to lack of water-supply census reporting after 1990.
Tier 1	Self-supplied domestic populations		
	Domestic self-supply by HUC8		
	Domestic self-supply by County		
	Domestic self-supply by water source		
Tier 2	Studies of actual metered domestic withdrawals		
	Studies of metered domestic withdrawals by month and source		
	Improve estimates using PWS service areas	X*	*See comment above regarding the Drinking Water Program's ongoing inventory project.
	Improve estimates using property data or other methods	X*	*Sara Levin suggested "web-scraping" realty sites like realtor.com. We would like pursue this if we are able to determine that the majority of Mass homes are in the realty database. *The drillers' logs in DEP's Well Driller Program would also be a good supplement. The database categorizes wells by use, including domestic use. Logs date back to the mid 1960s and can be plotted on a map of PWS service lines.
INDUSTRIAL			
Minimum reporting withdrawal:		0.1 MGD	Specifically, the Water Management Act threshold = 9 MG over 90 consecutive days (which works out to 0.1 MGD on average)
State agency (or agencies) responsible for collecting information:		MassDEP	
Tier "0"	Annual withdrawals reported for self-supplied facilities	X	
Tier 1	Annual withdrawals by facility (self-supplied) by water source (GW/SW)	X	
	Withdrawals reported by water type (Fresh/Saline)	X	DEP primarily regulates fresh-water use only, so fresh vs. saline is not distinguished
	Standard Industrial Codes included with withdrawal data		
	Groundwater withdrawals reported with reference to aquifer.		
Tier 2	Site-specific (by intake/well) annual withdrawals	X*	*WMA is currently developing an electronic-submission form for non-PWSs that will include this information

Table 1.

	Withdrawals reported by water source, water type, and industry classification	X*	*WMA is currently developing an electronic-submission form for non-PWSs that will include water-source data; however, we do NOT classify industry type nor regulate saline waters
	Deliveries from public supply to industrial facilities reported	X*	*PWSs report by category ("Industrial") only; deliveries to individual facilities are not reported
	Deliveries from other sources (treated wastewater) reported	X	See "Wastewater Treatment" category below
Tier 3	Site-specific consumptive use estimates		
	Site-specific discharges to surface water or land application	X*	*About 1/3 of NPDES data is paper only. An electronic filing rule was set by EPA in Dec 2015; states have till the end of this year to comply.
Extra:	GIS coverage of major self-supplied industrial sites	X	We have a shapefile of source points
IRRIGATION - CROPS			
Minimum reporting withdrawal:		0.1 MGD*	Specifically, the Water Management Act threshold = 9 MG over 90 consecutive days (which works out to 0.1 MGD on average)
State agency (or agencies) responsible for collecting information:		MassDEP	*Cranberry bogs are regulated by acreage rather than volume
Tier "0"	Annual aggregate withdrawals	X	
Tier 1	Aggregate annual withdrawals reported	X	
	Aggregate withdrawals reported by water source (GW/SW)	X*	*WMA is currently developing an electronic-submission form for non-PWSs that will include this information
	Acreage irrigated and method of irrigation reported by aggregate areas (Aggregate areas are able to summarize to county or HUC8)	X*	*WMA is developing an electronic-submission form for non-PWSs that will include irrigated farm acreage. Acreage is currently available only for cranberry bogs.
Tier 2	Site-specific monthly withdrawals	X*	*WMA is currently developing an electronic-submission form for non-PWSs that will include this information
	Withdrawals reported by well/sw diversion, or reclaimed wastewater	X*	*WMA is currently developing an electronic-submission form for non-PWSs that will include this information
	Withdrawals reported by source, with associated acres irrigated	*	*WMA is currently developing an electronic-submission form for non-PWSs that will include this information
	Crop types reported	*	Only cranberries are distinguished from other crops
	Method of irrigation reported		
Tier 3	Consumptive use and conveyance losses estimated by aggregate areas	X*	*For cranberry bogs only; we apply percentages taken from a past study that depend on the bog's design type
	Site-specific return flows reported		
Extra:	GIS coverage of irrigated lands	X*	*For cranberry bogs only

Table 1.

IRRIGATION - GOLF COURSES			
Minimum reporting withdrawal:		0.1 MGD	Specifically, the Water Management Act threshold = 9 MG over 90 consecutive days (which works out to 0.1 MGD on average)
State agency (or agencies) responsible for collecting information:		MassDEP	
Tier "0"	Location-specific list of golf courses	X	
Tier 1	Site-specific annual withdrawals	X	
	Site-specific monthly withdrawals	X*	*WMA is currently developing an electronic-submission form for non-PWSs that will include this information
	Withdrawals reported by water source (GW/SW)	X*	*WMA is currently developing an electronic-submission form for non-PWSs that will include this information
	Acres irrigated reported	*	*WMA is currently developing an electronic-submission form for non-PWSs that will include this information
	Groundwater withdrawals by aquifer		
Tier 2	Consumptive use estimates by course		Research on quantifying infiltration from golf-course irrigation seems to be lacking. Did USGS perform any studies in New England or elsewhere?
	Acres irrigated reported by type of irrigation		
Extra:	GIS coverage of golf courses, by owner type (pub/priv) and number of holes	X*	We have a point shapefile that does not include acreage, owner type or number of holes
THERMOELECTRIC			
Minimum reporting withdrawal:		0.1 MGD	Specifically, the Water Management Act threshold = 9 MG over 90 consecutive days (which works out to 0.1 MGD on average)
State agency (or agencies) responsible for collecting information:		MassDEP	<i>Note: thermoelectric plants fall into the WMA Program's "Industrial" category and have not been sub-categorized to date; sub-categorization is included in our workplan in order to distinguish these facilities. Also note that many coastal power plants are not regulated by WMA because WMA does not regulate saline waters.</i>
Tier "0"	List of large and small thermoelectric plants	X	*DPU likely has this information; awaiting confirmation
	Type of water sources used by plant	X	*DPU likely has this information; awaiting confirmation
Tier 1	Site-specific annual withdrawals	X*	*WMA is currently developing an electronic-submission form for non-PWSs that will include this information
	Site-specific monthly withdrawals	X*	*WMA is currently developing an electronic-submission form for non-PWSs that will include this information
	Site-specific net power generation	X*	*DPU likely has this information; awaiting confirmation

Table 1.

	Type of cooling system by site	X*	*DPU likely has this information; awaiting confirmation
	Withdrawals reported by water source (GW/SW) and type (Fresh/Saline)	X*	*WMA is currently developing an electronic-submission form for non-PWSs that will include water source data. We do not regulate saline waters.
	Source of information (plant, other agency, etc.)	X	
	Site-specific return flows		
Tier 2	Site-specific annual consumptive use		
	Site-specific monthly consumptive use		
Extra:	GIS coverage of thermoelectric power facilities	X	We have a shapefile of source points
LIVESTOCK			
	Minimum reporting withdrawal:	N/A	*MassDAR does not collect withdrawal data, but it does maintain record of facility locations and animal types and counts. MassDEP does not have record of any permits or registrations for livestock operations, which indicates that their use is likely below the WMA threshold of 0.1 MGD.
	State agency (or agencies) responsible for collecting information:	MassDAR*	
Tier "0"	Locations and water source for major livestock operations	X	
Tier 1	Annual withdrawals for major facilities		
	Annual withdrawals by water source		
Tier 2	Site-specific annual withdrawals for all facilities		
	Site-specific monthly withdrawals for all facilities		
	Withdrawals reported by water source (GW/SW)		
	Site-specific animal type and counts	X*	*Town-specific (facility-specific information is not publically available according to MassDAR)
Tier 3	Improved and verified coefficients for water use per head	X*	*The NRCS Massachusetts office referred us to a recent (2015) publication: https://www.ag.ndsu.edu/pubs/ansci/livestoc/as1763.pdf

Table 1.

MINING			
Minimum reporting withdrawal:		0.1 MGD	Specifically, the Water Management Act threshold = 9 MG over 90 consecutive days (which works out to 0.1 MGD on average) <i>*The only type of mining water use regulated under WMA is sand & gravel operations, which currently fall into the "industrial" category of our database; re-categorization is included in the workplan in order to distinguish these facilities.</i>
State agency (or agencies) responsible for collecting information:		MassDEP (limited)*	
Tier 1	Annual withdrawals by county	X	
	Annual withdrawals by HUC8	*	<i>*Withdrawals are tracked by Massachusetts' 28 major basins. The majority of HUC8 delineations overlap with those of the major basins; however, several differences do exist.</i>
	Withdrawals reported by source of water and water type	X*	<i>*WMA has source data but we do not regulate saline waters</i>
Tier 2	Site-specific annual and monthly withdrawals	X*	<i>*WMA is currently developing an electronic-submission form for non-PWSs that will include this information</i>
	Site-specific commodity identified		
Tier 3	Reporting on water use by process (dust suppression, dewatering, commodity processing, etc.)		
	Reporting on return flows/discharge of water from dewatering		
AQUACULTURE			
Minimum reporting withdrawal:		0.1 MGD	Specifically, the Water Management Act threshold = 9 MG over 90 consecutive days (which works out to 0.1 MGD on average) <i>*5 WMA permits are held by fish hatcheries that are used for waterway stocking (rather than for market sale); they fall into the "WMA Other" category. Database re-categorization is included in the workplan in order to distinguish these facilities.</i>
State agency (or agencies) responsible for collecting information:		MassDEP (limited)*, DFG, DPH, DAR	
Tier "0"	List of all facilities	X	
Tier 1	Annual withdrawals reported by county	X	<i>DFG's Division of Marine Fisheries and DPH report a small number (~6) of shellfish facilities statewide. DAR reports that they do not gather aquaculture withdrawal data.</i>
	Annual withdrawals reported by HUC8	*	<i>*Withdrawals are tracked by Massachusetts' 28 major basins. The majority of HUC8 delineations overlap with those of the major basins; however, several differences do exist.</i>
	Withdrawals reported by water source (GW/SW)	X	
	Withdrawals reported by water type (fresh/saline)	X	
Tier 2	Site-specific annual withdrawals	X	

Table 1.

	site-specific monthly withdrawals	X*	*WMA is currently developing an electronic-submission form for non-PWSs that will include this information
	Site-specific facility information	X	
Extra:	GIS coverage of aquaculture facilities	X	We have a shapefile of source points
COMMERCIAL			
Minimum reporting withdrawal:		0.1 MGD	
State agency (or agencies) responsible for collecting information:		MassDEP	
Tier 1	Annual deliveries from PWS for commercial use	X*	*PWSs report by category ("Commercial") only; deliveries to individual facilities are not reported
	Monthly deliveries from PWS for commercial use		
Tier 2	Site-specific annual withdrawals for self-supplied establishments	X*	*WMA is currently developing an electronic-submission form for non-PWSs that will include this information
	Site-specific monthly withdrawals for self-supplied establishments	X*	*WMA is currently developing an electronic-submission form for non-PWSs that will include this information
HYDROELECTRIC POWER			
Minimum reporting withdrawal:		N/A	
State agency (or agencies) responsible for collecting information:		<i>We (MassDEP) do not know of a state agency that collects hydroelectric water-use data. We have contacted DPU and are awaiting a response.</i>	
Tier 1	Site-specific annual water use (water use to spin turbines)		
	Site-specific monthly water use (water use to spin turbines)		
	Use reported by water type (Fresh, saline)		
	Source of information (plant, other agency, etc.)		
WASTEWATER TREATMENT			
State agency (or agencies) responsible for collecting information:		MassDEP*, MassDCR, MWRA	*Our NPDES staff are not aware of WWTPs who deliver to other users; however, a small number of municipal groundwater discharge permit holders do deliver to other businesses for irrigation and power-plant cooling water. WWTPs that reuse water onsite (e.g. for toilet flushing) are more common. MWRA maintains detailed wastewater records but does not deliver wastewater to other users. MassDCR maintains Inertbasin Transfer Act records, which include wastewater transfers.
Tier 1	Annual deliveries from WWTPs to other users	X	
	Monthly deliveries from WWTPs to other users	X	
	Deliveries specified by category (industrial, commercial, irrigation, etc.)		

Table 2. Massachusetts Data Collection History and Associated Databases

Water-Use Data Type	Managing Agency	Program	Start of Data Collection	Start of Electronic Data Collection	Relevant Regulations	Electronic Data Submittal Mechanism	Relevant Database	Publicly Accessible Data/ Tools
PWS withdrawals	MassDEP	Drinking Water	1947	2009	310 CMR 22.15	eDEP	WQTS	By request only
All withdrawals > 0.1 mgd	MassDEP	Water Management Act	circa 1988-1990	2009 (PWS only)	310 CMR 36.00	eDEP	WMA Database, eASR, RGPCD/UAW	WMA Permitting Tool, SWMI Interactive Map
Self-supplied domestic	MassDEP	Well Drillers Program	1960s	2010	310 CMR 46.00	eDEP	Well Drillers Database	Search Well
Groundwater discharges > 0.01 mgd	MassDEP	Ground Water Discharge	1983	2004	314 CMR 5.00	eDEP	Groundwater Database	By request only
Surface-water discharges	EPA/MassDEP	NPDES/ Wastewater	mid 1970s	2010	314 CMR 3.00 (surface-water discharge permits); 314 CMR 20 (reclaimed water permits); 40 CFR Part 122	netDMR	netDMR, ICIS, ECHO	ECHO
Interbasin transfers	MassDCR	Office of Water Resources	1984	N/A	313 CMR 4.00	N/A	Decision record spreadsheet	Partial decision record online

Table 3. Collaboration with State, Federal, and Regional Agencies

Agency/Program	Point of Contact	Data Type	Correspondence
DEP Water Management Program	Richard Friend, Duane LeVangie, Shi Chen	Water withdrawals > 0.1 MGD in all data categories	In person, phone, email
DEP Well Drillers Program	Steve Hallem	Domestic well and irrigation well data	In person, phone, email
DEP Drinking Water Program	Kristin Divris, Damon Guterman, Andrew Durham	PWS data and water utility infrastructure mapping	In person, phone, email
DEP NPDES	Cathy Vakalopoulos, Ted Saad, Susy King	Wastewater treatment data	In person, phone, email
DEP Ground Water Discharge	Marybeth Chubb, Linda Barba	Wastewater treatment data	In person, phone, email
DAR	Mike Cahill, Sean Bowen	Crop irrigation and livestock data	email
DCR/Water Resources Commission	Sara Cohen, Michele Drury	Interbasin transfers, domestic use (population estimates)	phone, email
DFG Division of Marine Fisheries	Chris Schillaci	Aquaculture data	email
DPH	Eric Hickey	Aquaculture data (wet storage facilities)	email
DPU	Paul Osbourne	Hydroelectric and thermoelectric data	phone, email (no response to date)
EPA	Neil Handler	Wastewater treatment data (NetDMR)	email
MAPC	Martin Pillsbury, Tim Reardon	Water utility infrastructure mapping	email
MWRA	Pam Heidell	Interbasin transfer and wastewater treatment data	phone, email
NRCS	Tom Akin (Mass office)	Livestock data	phone, email
USGS	Tomas Smieszek, Martha Nielsen, Sara Levin, Peter Weiskel	Data-gap and data-priority feedback. Also provided data sources of the USGS's 5-year national water-use reports.	In person, phone, email

Table 4. Water-Use Data Priorities

Data Limitations	Improvements
<p>1 Non-electronic data reporting:</p> <p>a) WMA: 100% of non-PWS data submissions</p>	<p>Developing online survey to collect Annual Report Forms; plan to distribute for collection of 2017 data</p>
<p>b) NPDES: ~ 1/3 of data submissions</p>	<p>Electronic-filing rule was issued December 2015; states have till December 2016 to file via netDMR</p>
<p>c) Groundwater Discharge: 75-80% of data submissions</p>	<p>Regulations (314 CMR 5.00) are under revision and include a provision for electronic reporting within a year of promulgation; anticipated promulgation date is 12/30/2016</p>
<p>2 Error-prone PWS reports</p>	<p>Creating new error flags in eASR to bolster QA/QC (e.g., querying a threshold per PWS to prevent unrealistically high or low entries)</p>
<p>3 Error-prone Ground Water Discharge reports</p>	<p>DEP data manager will conduct outreach to facility operators</p>
<p>4 Lack of common/consistent site ID to match old & new datasets, which prevents tracking of water-supply and discharge points over time</p>	<p>Assigning new ID nomenclature to WMA withdrawal points: Reg/Perm ID with "-01S", "-01G" suffix.</p>
<p>5 Lack of metadata (aka data dictionary) associated with datasets sent from DEP to USGS</p>	<p>Creating a data dictionary for all future database exports</p>
<p>6 Lack of location data for non-PWS source points</p>	<p>Requesting location data in new WMA electronic Annual Report Form for non-PWSs</p>
<p>7 Lack of adequate water-use categorization in certain WMA records</p>	<p>Splitting WMA's "Other" use category into specific categories (commercial, fish, ski, etc.)</p>
<p>8 Lack of acreage reported for golf courses and cropland</p>	<p>Incorporating into new electronic ARF for non-PWSs</p>
<p>9 Lack of data on saline-water (e.g. hydro- and thermo-electric) and low-volume (<0.1 mgd) non-PWS uses</p>	<p>We will continue outreach to other agencies to develop better estimates of saline water uses and of small uses.</p>
<p>10 Lack of aquifer designation for groundwater withdrawals</p>	<p>DEP's WQTS database contains "well type" data that provides an indication of the aquifer type. The well types include gravel-packed, bedrock, hand-dug, horizontal, rainey, tubular, and spring. All types but bedrock are typically completed in unconsolidated material, so this "well type" data could be used to categorize groundwater sources into sand & gravel vs. bedrock aquifers. Springs are a mix of bedrock and unconsolidated material, but we do have a separate record of their aquifer types (USGS WRIR 2003-4266). DEP could deduce aquifer types for all PWS wells based on this information.</p>

Table 4.

11 Lack of private (domestic) well data	<p>We are considering a combination of four approaches:</p> <p>1) Identify all partially-served towns via PWSs' eASRs and determine for which towns the remainder of the population is on private wells (vs. another Town PWS or a small non-municipal PWS, such as an apartment complex having its own well).</p>
	<p>2) Obtain Mass realty records and identify which houses are on PWS vs. private wells via web-scraping. This would reveal only homes that were recently for sale. This approach will be useful if we are able to determine that most homes are in the realty database.</p>
	<p>3) DEP's Drinking Water Program began an inventory of digital PWS infrastructure maps in May 2016, which will compile several existing datasets and fill in data gaps. Project completion is set for early 2017.</p>
	<p>4) Map all "domestic" wells from the DEP Well Drillers Program. Records date back to the mid-1960s. This approach would serve to supplement the other approaches because the database is incomplete.</p>