27 September 2016

MEMORANDUM

TO: Steven Patten, Walla Walla Basin Watershed Council

FROM: Phil Brown, RG, LHg
Laura Hanna, GIT

SUBJECT: Washington Aquifer Storage and Recharge (ASR) Overview

Summary of WAC 173-157, Application for an Underground Artificial Storage and Recovery System

This narrative is based on WAC 173-157 which provides a step-wise process for permitting an ASR project. This outline is a good starting point, though the actual work flow may vary based on the Department of Ecology’s (DOE) project-specific requests.

The first step to acquiring an ASR permit in Washington is to secure the water rights to the source water and prepare a Reservoir Permit application to store and collect water underground. Prior to actual ASR testing, this permit is based on a desktop analysis of the hydrogeology and water quality. This is followed by a Preliminary Permit to drill a test well (or use an existing well) and conduct ASR pilot testing. The testing period is designed to collect the data required to confirm the assessments, projections, and evaluations produced to develop the original reservoir permit application, and this confirmation is the basis for a final permit. In Oregon, the testing duration is typically 5-years consistent with many state limited license periods. Ecology is open to testing periods supported by annual preliminary permits for as few as two years, though the upper limit of the testing period has not been explored by other projects. A typical ASR development approach usually follows this pattern:

✓ Conditioned Reservoir Permit Application
✓ Preliminary Permit (ASR Application)
  o Year 1: incrementally up-scaled tests and annual report
  o Years 2 – 5: operational-scale ASR with annual reports
✓ Final Reservoir Permit

If more than one well is a possibility, applicants may structure the Reservoir Permit to consider system expansion to additional wells or locations to avoid or limit additional permitting effort as a project develops. During this time, it can be advantageous to request permit extensions to allow testing at new locations before a final permit is requested. The entire process is iterative and will
require application submittals as complete as possible but knowing that updates will be needed as additional information is acquired through testing. The primary elements of an ASR application and process are described below.

Permitting Overview

The following permits that will be required are described below.

1. **Water rights to the source water** – The held water rights need to specify intended use. If any proposed use is different than those listed on the base right, a secondary permit will be required.

2. **Conditioned Reservoir Permit** – Required for collecting and storing water underground (RCW 90.03.370 (2)(a)). Prior to ASR testing, many of the required permit elements are based on desktop studies and rely on assumptions. This permit application is updated after testing with a request for a final reservoir permit.

3. **Preliminary Permit** – Application to drill a test well (if an existing well isn’t being converted for use as an ASR well) and to conduct ASR pilot testing.

4. **Secondary Permit** – Required if the proposed use of the recovered water is different from the primary water right. A Secondary permit is not required if the primary water right includes the intended beneficial reuse of the source water.

5. **Final Reservoir Permit** – After all documentation is compiled and submitted as described above and below, a complete ASR permit application is submitted.

6. **Underground Injection Control (UIC) Program/Registration** – UIC wells need to be registered with Washington DOE which requires submittal of construction and technical specs.

7. **NPDES Permit** – If any part of the planned ASR operation will include direct discharge to surface water, an NPDES permit is required to demonstrate how water quality standards to protect aquatic life (173-201A WAC) will be met.

It is understood that at least the Reservoir and Preliminary Permits will be submitted initially as complete as possible, with the client and DOE knowing there is missing information but as the project progresses, resubmittal of documentation will occur and a final application provided. Additional process detail is provided in the following sections.

Pre-Application Form and Meeting

ASR in Washington is managed by the Washington DOE in consultation with Department of Health. There is a preapplication consultation that the involved parties attend to discuss the project plan, monitoring, and mitigation requirements. The goal is to ensure the project sufficiently addresses any specific issues, data needs, or conditions affecting permitting can be discussed prior to the applicant spending additional time and resources on capital investments or developing the application’s supporting documents. To achieve this goal, it is necessary for the applicant to have framed the project sufficiently and fill out the preapplication form providing the following information:

- ✔ Customer Information (project owner/applicant)
- ✔ Authorized agent (if applicable)
✓ Project Description, including:
  • Type of water right required
  • Project location
  • Purpose of proposed project
  • Planned appropriation of water
  • Duration of water use
✓ Estimated amount of water needed
✓ Maps containing:
  • Aerial view of project area
  • Reference to Township, Range, Section and Quarter Section
  • Proposed point(s) of withdrawal/diversion and names of withdrawal facilities
  • Place of use boundaries
✓ New Water Right Checklist
  • To be used if seeking a new water right
✓ Change Water Right Checklist
  • To be used to change an existing water right

Submit the Pre-Application form, application fee and other permits to the DOE Water Resources Regional office:

**Eastern Region – Spokane**
4601 N. Monroe St.
Spokane, WA 99205-1265
(509) 329-3400
wrPreApp@ecy.wa.gov

**ASR Application**

The following permit elements are required by the ASR Permit Application though addressing them to the extent possible prior to the pre-application meeting will facilitate the applicant’s understanding of the feasibility and the path forward for obtaining the permit.

After the pre-application meeting, the completion of the below components of the ASR Permit application, these elements are completed to the best ability of the project proponent. There will be information that is not available until the pilot testing is complete so the process is iterative with DOE as data/reports become available. Ecology may also request additional documents or project permitting elements such as a groundwater flow model to represent hydraulic response to ASR when there is a risk of storage zone interaction with surface water or critical surficial aquifers. DOE may also request an Environmental Assessment and Analysis Report with the requirements of WAC 173-157-150 (1) and (2).

**Hydrogeologic System Description**

The hydrogeologic system description (WAC 173-157-120) should include a conceptual hydrogeologic model prepared by a licensed WA hydrogeologist describing, at a minimum estimates for:
  • Characteristics of the aquifer targeted for storage to including:
- Lateral and vertical extent
- Confined/unconfined
- Permeability
- Total storage volume available
- Effective hydraulic conductivity
- Potential for physio-chemical changes in the aquifer or vadose zone as a consequence of recharge
- Estimated flow direction(s) and rate of movement
- Anticipated changes to the groundwater system due to the proposed ASR
- Estimated area affected
- Geologic setting
- Locations of existing natural hazards and a plan to mitigate impacts
- Surface water locations that could be affected
- Well locations that could be affected
- Chemical and physical composition of the source water(s) and their compatibility with the receiving (background) groundwater aquifer

Project Operation Plan

The project operation plan (WAC 173-157-130) prepared by a licensed WA engineer/geologist should describe the pilot study and operational phases and include, at a minimum:

- Quantity and times of year source water is available for recharge
- The proposed rate of injection and withdrawal of water
- The length of time the water is proposed to be stored
- The location, number, and capacity of proposed recharge wells or infiltration basins, and recovery facilities
- Any variability in quality and reliability of the source water
- A description of water treatment method(s) to be used at the time of injection and recovery to ensure compliance with water quality standards (WAC 173-200) and DOE’s anti-degradation policy
- Provide the quantity, timing, duration, and water quality parameters (chlorine, pH and dissolved oxygen) if discharging ASR water to a surface body (if appropriate)
- Provide the quantity, duration, quality, and means of discharge groundwater and suspended sediment from the ASR well (if appropriate)
- Destination(s) and permitting for water used for operation and maintenance
- Quality assurance project plan (QAPP) describing sampling methodology, data quality objectives, analytical methods and detection limits, and quality assurance sampling protocols.

Legal Framework

The legal framework for the project (WAC 173-157-140) should include, at a minimum:

- Documentation of the water rights for source waters
- A list of other water rights within the ASR project area
- Instream flows established by the DOE or stream closures in the vicinity of the point of diversion/withdrawal of the source
Ownership and control of any facilities to be used

Environmental Assessment and Analysis

The environmental assessment and analysis (WAC 173-157-150) must, at a minimum, describe:

- The environment within the ASR project area, including:
  - Proximity to contaminated areas
  - Present/prior land uses
  - Location(s) of historical/existing wetlands
  - Location(s) of historical/existing flood plain(s)
  - Location(s) of historical/existing surface water body or spring, including documented:
    - Base flow
    - Seven-day low flows
    - Maximum flows
- Adverse impacts to the surrounding environment by ASR, including but not limited to:
  - Slope stability
  - Wetland habitat
  - Flood plain
  - Ground deformation
  - Surface water or spring
- If an environmental assessment has already been performed, simply reference the document

The environmental assessment will determine if a determination of non-significance can be granted or if an environmental impact statement (EIS) is required per SEPA regulations.

Project Mitigation Plan

The project mitigation plan (WAC 173-157-160), if necessary, must be reviewed and approved by an experienced licensed WA engineer. The mitigation plan will describe actions to prevent adverse impacts to the environment and methods of evaluation of the effectiveness of these actions.

Project Monitoring Plan

The project monitoring plan (WAC 173-157-170) will be used to evaluate and verify assumptions in the conceptual model during pilot and operational phases and must include:

- Proposed time intervals for sampling and reporting
- Describe measurement methodology, threshold values, and evaluation techniques for:
  - Quality of the source and receiving waters
  - Actual quantity of water injected
  - Changes in groundwater piezometric elevations in the receiving aquifer
  - The percentage of the initial amount of stored water that is recoverable after varying lengths of storage time
• Data necessary to evaluate the effectiveness of the required mitigation
• Other data that is determined by DOE or you necessary for monitoring

An annual report submittal of the monitoring data is required. Based on the project complexity, DOE could require more frequent submittals.

Groundwater Flow Model

It is not specified in the WAC, but it is possible that Ecology could request a groundwater flow model to simulate hydrogeologic response to ASR operations.

All Known, Available and Reasonable Methods of Prevention, Control and Treatment (AKART) Analysis

The AKART analysis provides an evaluation of the treatment methods, costs, and effectiveness of treating the source water to meet groundwater protection and anti-degradation standards. This element is not specified in the WAC, but is currently the process used by DOE to support either a requirement for additional treatment or to issue a determination of Overriding Public Interest (OPI) with respect to the water quality associated with the proposed project.

In many cases, there are constituents in treated drinking water (residual chlorine and disinfection byproducts for example) or surface water (nitrate for example) that are not present in groundwater at the ASR well. Storage of this water violates the State’s anti-degradation policy in principal. However, the State recognizes the public interest in ASR as a water resource management tool with significant environmental benefits, and therefore can allow exceptions with respect to specific constituents in specific concentration ranges if Ecology determines the potential for adverse impacts are minimal and are outweighed by the benefits of the proposed project. The AKART analysis provides the framework for making this judgement by providing the information needed to compare the costs, risks, and likely effectiveness with the project goals. Several AKART analyses have been submitted to Ecology and approved, and therefore a significant body of treatment technology and cost structure is available to draw on for future projects. This work is typically completed by civil engineers with a background in water treatment technology, treatability studies, and facility construction. However, there may be enough AKART information currently available to make adaptation of existing information to a specific project feasible in consultation with DOE.

LH/PAB

cc: K. Lindsey, RG (EA Engineering)