

New

Ministry

Environment and Protected Areas

Describe: Basic Job Details
Position

Position ID

Position Name

Water Modelling Data Scientist

Requested Class

Scientific 3

Job Focus

Operations/Program

Supervisory Level

00 - No Supervision

Agency (ministry) code

Cost Centre

Program Code: (enter if required)

Employee

Employee Name (or Vacant)

Vacant

Organizational Structure

Division, Branch/Unit

 WCED/WRP/Integrated Environmental Modelling

Supervisor's Position ID

Supervisor's Position Name

Modelling Support Team Lead

Supervisor's Current Class

Engineering & Related Level 4

Design: Identify Job Duties and Value
Job Purpose and Organizational Context

Why the job exists:

The Water Modelling Data Scientist position undertakes analyses and prediction of water-demand and supply in the province using data science and computational modelling techniques. The incumbent's work contributes to the provincial water management system.

The contributions from this position have a direct and indirect impact on water users and managers across the province, those who make water and watershed related decisions. The information provided by the work of the incumbent supports a variety of decisions including but not limited to, water licence approvals and compliance, health aquatic ecosystems, emergency management, drought management, water sharing agreements, water infrastructure operations, regulatory assurance, irrigation and infrastructure expansion, transboundary water agreements, and land-use planning.

The incumbent helps find the best, innovative, science-based solutions to analyze and interpret water management-related data. Their work involves downloading, preprocessing, and post-processing of hydro-climate data with the ability to transform these inputs into operational tools to support near-real time modelling.

Responsibilities

1. Data collection and management, and modelling and analysis:

- i. Accessing monitoring data, including climate and weather data from various sources such as sensors, satellite imagery, historical records and surveys stored in data warehouses and preprocessing and cleaning the data to ensure data integrity and suitability for analyses.
- ii. Organizing and managing large datasets for ease of access (for modelling) and to ensure data integrity.
- iii. Developing and implementing mathematical and computational models to simulate water-related processes and phenomena including water availability and demand.
- iv. Performing statistical analyses to understand trends, correlations, and anomalies in water-related data.
- v. Developing, supporting the development of and applying predictive models to forecast water availability, demand, water quality, and associated risks (e.g., floods, droughts).
- vi. Helping with ongoing development and maintenance of software tools for water modelling and data analysis including Modelling Expert System, Alberta Data Automation for Environmental Models, Modelling Integration Platform, Alberta Flow Estimation Tool for Ungauged Watersheds, Alberta Climate Change Projections Engine, Drought Management Dashboard and Alberta ArchHydro.
- vii. Utilizing specialized software and platforms for water modelling, Geographic Information Systems, and data analysis (e.g., Python, R, ArcGIS Pro).

2. Machine Learning and Data Science:

- i. Developing and applying machine learning algorithms to enhance the accuracy and efficiency of the Government of Alberta's water models through accurate, efficient and dependable model calibration and validation processes by providing techniques for parameter optimization, sensitivity analyses and uncertainty quantification.
- ii. Creating visualizations to represent data and model results clearly and effectively for various audiences (including technical specialists and the public).
- iii. Informing water management policy, programs and decisions using data-driven insights and predictive modeling results.

3. Research and Development

- i. Enhancing knowledge in water modelling and data science with the latest research and advancements.
- ii. Identifying, and implementing innovative techniques and technologies to improve water modelling practices.
- iii. Working with hydrologists, meteorologists, modellers, climate and environmental scientists in the department, Government of Alberta, partners and external stakeholders to integrate datasets and new approaches into water models.

4. Reporting and Communication:

- i. Preparing technical and non-technical reports and presentations to communicate findings and recommendations to various audiences, including policy and program decision makers.
- ii. Collaborating with partner ministries and agencies, academia, other governments, industry, environmental organizations, and others to inform policy, programs and decision-making in water resource management.
- iii. Educating various stakeholders on water-related issues.
- iv. Supporting the development of websites and public material for dissemination of modelling results, data and analysis including visualization.

5. Support and lead other branch, department and Government of Alberta priorities and initiatives, as required.

- i. Supporting water, environment and natural resource management work of the Government, as required.

Problem Solving

Typical problems solved:

The incumbent is a member of the Modelling Support Team with which provides water -related modelling data analysis and interpretation to inform various issues related to water licence approvals and compliance, health aquatic ecosystems, emergency management, drought management, water sharing agreements, water infrastructure operations, regulatory programs, irrigation and infrastructure expansion, transboundary water agreements, and land-use planning.

This position will provide leadership and oversight in applying advanced data analytics as well as AI and machine learning to maintain and enhance the existing provincial water-related modelling tools, platforms, and processes. This incumbent is expected to find the best, innovative, science-based solutions to analyze and interpret water management-related data.

This position will explore different innovative techniques and methods to:

- i. streamline and automate input and output data processing for the water modelling tools as well as modelling platforms, and
- ii. decipher and communicate large volumes of modelling data and text to the department management, decision makers, and public in a meaningful way.

The incumbent's work involves downloading, preprocessing, and post-processing of hydro-climate data with the ability to transform these inputs into operational tools to support near-real time modelling.

Types of guidance available for problem solving:

- Working under the guidance of the team lead to understand data and modelling problems requiring solutions.
- Working with peers to scope issues, identify options, and find the best solutions to tackle water modelling related issues.
- The Modelling Community of Practice provides peer support and learnings (across water, air, cumulative effects, etc. disciplines).
- Collaborating with colleagues throughout the branch, division, and department as well as colleagues in other provincial ministries and agencies together with water modelling experts in various levels of government (federal, provincial, and municipal), academia and other renowned research institutions for continuous improvement of methods.

Direct or indirect impacts of decisions:

The contributions from this position have an impact on a range of internal and external stakeholders across the province, including water users (e.g., licencees), water managers, policy developers, etc. Many of these stakeholders rely on synthesized data and information including predictive modeling results and associated uncertainties to make informed decisions on numerous critical areas of water related businesses including:

- **Water Licence Approvals and Compliance**
- **Environmental Health and Integration of Ecosystems:** Providing information to support the protection and rehabilitation of aquatic and terrestrial ecosystems to maintain biodiversity and ecosystem services.
- **Emergency Management:** Informing strategies and responses to water-related emergencies such as floods and droughts.
- **Drought Management:** Providing data and predictions to help manage and mitigate the impacts of drought conditions.
- **Water Management**
- **Transboundary Water Agreements**

By developing and applying advanced predictive models, this position enables effective and efficient decision-making. This work supports water resources management and long-term sustainability and resilience of Alberta's water

systems.

Key Relationships

Major stakeholders and purpose of interactions:

1. The incumbent will need to communicate with internal and external stakeholders such as other GoA ministries, Alberta Energy Regulator (AER), municipal governments, federal government, irrigation districts, academia, and other research institutions to provide them with modelling results and how these advanced analyses could be used to inform decision making.
2. Main interactions are within the branch and division, including supporting transboundary teams in reporting and planning.
3. Work will also occur with other divisions, including the Regulatory Assurance Division to inform licence and transfer decisions, Resource Stewardship Division to integrate monitoring information, and Office of the Chief Scientist on emergent analytical and modelling techniques.
4. Supporting other departments, including Agriculture & Irrigation on water infrastructure and operations
5. Collaborating with external stakeholders in other governments, academia and organizations as they are generally technical peers.

Required Education, Experience and Technical Competencies

Education Level

Bachelor's Degree (4 year)

Focus/Major

Science

2nd Major/Minor if applicable

Engineering

Designation

If other, specify:

Advanced degrees (Master's degree or PhD) may be preferred.

Job-specific experience, technical competencies, certification and/or training:

The minimum education for this position is a degree in hydrology, environmental science, data science, computer science, or a related field, from a recognized university or institution, with minimum of six years related working experience. Master degree with four years or Ph.D. degree with two years of related experience is preferable.

This position requires:

- Proficiency in programming languages such as Python or R, data analysis, machine learning, and statistical modelling.
- A thorough understanding of hydrological processes, water resources management, and environmental science.
- Strong analytical and problem-solving skills to interpret complex data sets and draw meaningful conclusions.
- Ability to effectively communicate technical information to both technical and non-technical audiences.
- Experience with big data platforms and cloud-based data analytics tools (e.g., AWS, Azure) is a plus.
- Experience with database management using Microsoft SQL.
- Valid Alberta driver's licence.
- Ability to communicate effectively - in writing, orally and non-verbal - to various audiences

Assets for this position include:

- Knowledge and experience of ESRI GIS technology including ArcGIS Enterprise and ArcGIS Pro
- Knowledge and experience of Safe Software technology such as Feature Manipulation Engine.
- Knowledge of department's enterprise databases.
- Familiarity working with remote sensing and hydro-climate data.

Behavioral Competencies

Competency	Level					Level Definition	Examples of how this level best represents the job
	A	B	C	D	E		
Creative Problem Solving	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<p>Works in open teams to share ideas and process issues:</p> <ul style="list-style-type: none"> • Uses wide range of techniques to break down problems • Allows others to think creatively and voice ideas • Brings the right people together to solve issues • Identifies new solutions for the organization 	<p>Streamline and automate input and output data processing for the water modelling tools as well as modelling platforms requires exploring different innovative techniques and methods.</p> <p>Decipher and communicate large volumes of modelling data and text to the department management, decision makers, and public in a meaningful way.</p> <p>Describe and address water management problems and the potential implications requires strong communication and problem solving skills.</p>
Systems Thinking	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<p>Takes a long-term view towards organization's objectives and how to achieve them:</p> <ul style="list-style-type: none"> • Takes holistic long-term view of challenges and opportunities • Anticipates outcomes and potential impacts, seeks stakeholder perspectives • Works towards actions and plans aligned with APS values • Works with others to identify areas for collaboration 	<p>Development of the next generation of existing modelling platforms, tools using AI/machine learning requires system approach from the conceptual to completion stage.</p> <p>Application of water modelling to sub-basin and basin levels requires strong knowledge of the system and interaction of system components.</p>
Build Collaborative Environments	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<p>Collaborates across functional areas and proactively addresses conflict:</p> <ul style="list-style-type: none"> • Encourages broad thinking on projects, and works to eliminate barriers to progress • Facilitates communication and collaboration 	<p>Collaboration with partners, stakeholders and research communities is essential to achieve modelling outcome to serve clients.</p>

		<ul style="list-style-type: none"> • Anticipates and reduces conflict at the outset • Credits others and gets talent recognized • Promotes collaboration and commitment 	
Drive for Results	<input type="radio"/> <input type="radio"/> <input checked="" type="radio"/> <input type="radio"/> <input type="radio"/>	<p>Takes and delegates responsibility for outcomes:</p> <ul style="list-style-type: none"> • Uses variety of resources to monitor own performance standards • Acknowledges even indirect responsibility • Commits to what is good for Albertans even if not immediately accepted • Reaches goals consistent with APS direction 	<p>This position is required to work professionally and independently with minimal supervision and is willing to commit, take acceptable risk and be accountable on modelling works.</p>
Agility	<input type="radio"/> <input type="radio"/> <input checked="" type="radio"/> <input type="radio"/> <input type="radio"/>	<p>Identifies and manages required change and the associated risks:</p> <ul style="list-style-type: none"> • Identifies alternative approaches and supports others to do the same • Proactively explains impact of changes • Anticipates and mitigates emotions of others • Anticipates obstacles and stays focused on goals • Makes decisions and takes action in uncertain situations and creates a backup plan 	<p>Changes to business, technology and environments are constant. It is important for this position to be able to anticipate, assess and adapt to changing priorities, and make effective modelling technology, IT, information management, and data-related decisions.</p>