California Water Boards
Data Literacy Strategy

November 2020

California Water Boards
COLLEGE OF WATER INFORMATICS

Foreword

The future of water and water management in California faces many challenges, including rising temperatures, extreme droughts and floods, larger and more frequent forest fires, aging infrastructure, systemic environmental injustices, and many other obstacles that will be exacerbated by climate change. In April 2019, Governor Gavin Newsom issued Executive Order N-10-19, which instructed agencies to develop a Water Resiliency Portfolio (published in July 2020) that would recommend actions the State should take to meet the challenges it is facing and to enable water security for all Californians. Addressing each of these complicated challenges will require modernized water data systems, access, and literacy by all agencies so they can make real-time and informed water management decisions (see Water Resiliency Portfolio Action 22 and 22.1).

In August 2020, the California Office of the Chief Data Officer published the State Data Strategy, which outlines a strategic approach to act on the Office's mission to "empower use of data by ensuring the state has the infrastructure, processes, and people to manage, access, and use data efficiently, effectively, securely, and responsibly". Objective 6 of the State Data Strategy identifies the need to spur data use and ability through the assessment of current training opportunities and through the potential advancement of a statewide approach to data skills development.

The State Water Resources Control Board (State Water Board) and Regional Water Quality Control Boards (Regional Board and collectively, the Water Boards) is currently undergoing a much-needed cultural change to becoming a more data-driven organization. Improving data literacy is critical to supporting this shift in data culture. Data literacy is the ability to read, write, work with, and comprehend data. Achieving data literacy involves a continuum of learning and skills development that enables and empowers individuals to achieve their goals and efficiently and effectively do their work. This means individuals develop relevant data fluency by learning what is useful for them and their work but does not mean everyone needs to know how to code. The development and implementation of a data literacy strategy for the Water Boards is a key component in delivering on the Office of Information Management and Analysis' (OIMA) mission to "enhance the value, quality, understanding, and accessibility of Water Boards data." Individuals who are capable and comfortable speaking data can better and more efficiently manage data as the public asset to support the broader Water Boards' mission:

"To preserve, enhance, and restore the quality of California's water resources and drinking water for the protection of the environment, public health, and all beneficial uses, and to ensure proper water resource allocation and efficient use, for the benefit of present and future generations."

Improving data literacy of the Water Boards workforce includes both skills development and professional development on data and data literacy topics. Without a measured and intentional approach to improving data literacy, off-the shelf solutions for training and educational resources will remain insufficient, continue to be distributed inequitably, and will remain inconsistent with the strategic goals of the Water Boards, specifically Goal 7: Ensure that the Water Boards have access to information and expertise, including employees with appropriate knowledge and skills, needed to effectively and efficiently carry out the Water Boards' mission.

This Data Literacy Strategy (Strategy) has been purposefully constructed to address such issues, and align with California's Water Resiliency Portfolio, State Data Strategy, and the Water Boards Open Data Resolution (Resolution No. 2018-0032) and Strategic Data Action Plan's guiding principles:

1. Make Data Accessible ("Open First"): our organization values transparency and strives to make all critical public data available in machine-readable datasets with metadata and data dictionaries.
2. Understand Data Quality and Integrity: our data are of known and acceptable quality and we deploy practices to protect its integrity with standards and protocols.
3. Improve Data Literacy: our whole organization understands its data needs and responsibilities, can speak the language of data science, and staff and managers have relevant data fluency.
4. Use Data to Govern: our organization uses data to govern and makes decisions that are in the best interest of our mission(s).
5. Govern our Data: our organization takes proactive steps to develop effective data and information technology management practices to ensure our data flows to where it is needed in a timely manner while complying with our data sharing policies.

Vision

The Water Boards workforce collects, stores, and uses data effectively every day in every department, office, region, and division, to inform decisions, discover insights, and refine processes. The workforce is data literate and is aware of and fully utilizes the training and educational resources at their disposal. Our data ecosystems are transparent and vibrant so that our employees, programs, work teams, partners, and the public are aligned to support the Water Boards' missions.

Mission

Data training and literacy resources are accessible, flexible, and useful to the Water Boards workforce so that individuals are empowered to effectively do their work and support the Water Boards' mission.

The mission of OIMA and the Data Literacy Strategy Development Team is to enhance the value, quality, and accessibility of Water Boards data literacy training and resources through strategic activities, coordination, and changing the culture of data literacy at the Water Boards.

The purpose of this Strategy is to ensure the vision and mission described above are made concrete while aligning with existing processes and resources of the Water Boards. This document outlines a proposal for aligning efforts for data literacy with a strategy for better serving the needs of California, and describes how we will invest in Water Boards workforce's knowledge, skills and abilities to effectively collect, govern, utilize, and share data. This Strategy has been developed to address the issues and needs of the Water Boards workforce as they are now, but also with the intention of being an adaptable and living document so it can be revised as the data literacy needs of the Water Boards evolve.

This Strategy was developed by the Data Literacy Strategy Development Team:

- Greg Gearheart, Deputy Director, OIMA

- Jarma Bennett, Senior Water Resources Control Engineer, OIMA

- Anna Holder, Environmental Scientist, OIMA

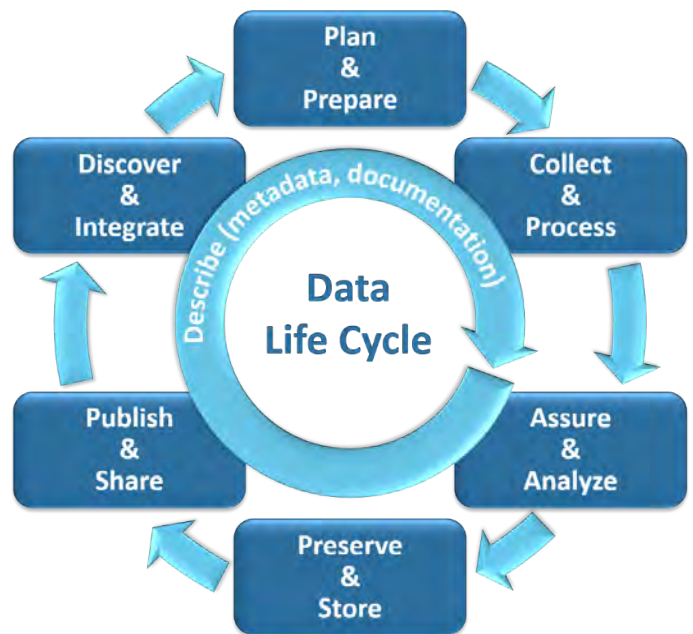- Vyki Englert, Principal and Co-Founder, [Compiler LA]

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Introduction

Achieving the Water Boards mission in the face of the many complicated, compounding, and unprecedented environmental and societal challenges facing California will be no easy task. The Water Boards programs and priorities that have been developed to achieve this mission are complex and vary in scale and scope. Unsurprisingly, the data systems that have been developed to capture the critical data and information necessary to manage program functions and priorities are just as diverse and complex as the programs they support. Combine this with the ever present resource limitations that all agencies face, the backdrop of the technological and data science revolutions currently underway, and the exponential growth and availability of new, larger, and more complex datasets, and the need for efficient and effective data systems and data literacy throughout the entire Water Boards workforce becomes abundantly apparent.

Now, and more than ever before, every person in the Water Boards needs to have the skills and know how to access, manage, use, interpret and communicate the data and information that is essential to their work. The data science field as we know it today emerged around 2010 and continues to rapidly evolve and grow. Because of this, the majority of the Water Boards workforce has not had the opportunity or ability to learn or develop these now integral and critical skills. It is vital to the organization that we allocate resources to improve data literacy and provide training on data concepts and tools that have direct application to the workforce (e.g. efficiently managing datasets, effectively visualizing and communicating with data through the use of available Business Intelligence tools).

Data literacy is the ability to read, write, work with, and comprehend data. This encompasses being able to find and access data, glean information from data, including how to interpret graphs and charts to draw appropriate conclusions from data, and recognize when data are being used in misleading or inappropriate ways. This means individuals develop relevant data fluency by learning what is useful for them and their work but does not mean everyone needs to know how to code. The many steps along the data life cycle (see inset to the right) and nuances of using and managing data itself make the task of ensuring that data users are educated and trained to find and communicate the most meaning from data is complex. Add into this that data users at the Water Boards learn differently, and have different jobs, priorities, familiarity, and

aptitude to work with data, implementing a comprehensive data literacy strategy with limited resources is a challenge. To meet this challenge, this Data Literacy Strategy (Strategy) will implement diverse approaches and materials designed to meet people where they are, support individuals in the data and data literacy challenges they may face in their work, and do so in a manner that is socially equitable.

This Strategy describes how we will invest in Water Boards workforce's knowledge, skills, and abilities to effectively collect, govern, utilize, and share data. Successful implementation of this Strategy will rely on free training and resource opportunities, in-house expertise, as well as more traditional educational resources such as classroom-style training courses. This Strategy is meant to serve as the foundation upon which we can begin to address the issues and needs of the Water Boards workforce as they are now and defines three Phases, described in the Implementation Section of this Strategy) which will be used to evaluate progress over time, with the intention of being an adaptable and living document that will be revisited and revised as the data literacy needs of the Water Boards evolve.

Data Use and Skills Survey

To understand the Water Boards' current data literacy and needs, and to begin to address Guiding Principle 3 from the Strategic Data Action Plan, OIMA distributed a Data Use and Skills Survey to the entire Water Boards workforce between August and September 2019. Approximately 40% of the Water Boards' workforce completed the survey. The Data Use and Skills Survey results show that staff want training on a range of data tools and concepts at a variety of literacy levels (i.e., beginner, intermediate, advanced), where:

- **Beginner** level courses are intended for individuals who need resources that cover fundamental data science concepts, available data science resources and tools, and how to start implementing data science practices in their work.

- **Intermediate** level courses are intended for individuals who need resources that will help them expand on the fundamentals, troubleshoot problems as they arise, and implement more complex data science practices in their work.

- **Advanced** level courses are intended for individuals who need resources that will help them increase the depth, breadth, and specialty of the data science practices they use in their work, including resources that keep them up to date on new advances in their specialized areas of interest.

Also see Appendix 1 for key insights from the Data Use and Skills Survey text fields. The repetitive and consistent distribution of this or similar surveys will be key elements of the data literacy program evaluation.

Data Literacy Strategy Audiences

Each individual at the Water Boards has different data literacy needs and availability for training. Based on the Data Use and Skills Survey responses and additional conversations with Water Board staff, the following audiences for a data literacy program were identified.

Internal Audiences

- **Executives and Managers:** Often self-motivated and time limited. Executives and managers are unlikely to be proficient in hard skills related to data, but they may have some amount of data literacy. They need to understand data to better direct and support teams and deliver outcomes for the agency. These individuals often have some budget authority and are able to highlight and approve funding for training and resource that are needed throughout the Water Boards.

- **Staff Data User:** Staff who are data users and likely already proficient in Excel. These individuals are eager to use data, are confident in their ability to complete current tasks and implement data science methodologies to improve their workflows and efficiency. If they need additional support, they likely know the training and resources for which to ask.

- **Staff Non-Data User:** Staff who do not currently use or analyze data (or do not realize they do) but for whom access to and skills to use data could improve effectiveness or accuracy of tasks and programs for which they are responsible. Non-data users may not realize areas in which they could use additional support, and therefore may not know the training and resources for which to ask.

- **New Hire:** Needs to be oriented to Water Boards' data systems during onboarding quickly and effectively, may have a better understanding of private sector skills and tools in data. Opportunity to capture benefits of "fresh eyes" and change existing patterns and culture of data use in team or role.

External Audiences

- **General public:** Interested in water information and its impacts to their decision making and communities.

- **Technical public:** Have technical skills but no experience with water domain.

- **Graduate students:** Have some water expertise and/or some technical skills.

- **Water professionals:** Deep subject matter expertise, some technical skills.

Blockers and Limitations

According to the Data Use and Skills Survey responses and additional conversations Data Literacy Strategy Development Team had with Water Board staff, an individual belonging to any audience may face one or more of three common blockers to learning or using what they have learned.

Current Blockers

- Little or no experience in self-directed learning
- No support from supervisor or management to use work time for literacy or skills development
- Unable to prioritize time for traditional literacy or skills development

There are also limitations the Water Boards faces that hinder the ability to provide adequate and comprehensive data literacy training for the entire workforce.

Current Limitations

- Existing off-the-shelf curriculum is insufficient for needs of staff
- Lack of staff time and resources to develop Water Board-specific training
- When resources are available, the time to develop new coursework through the Water Boards Training Academy is 6-8 months, and staff need comprehensive training and resources now
- Time to procure an enterprise system for skill development is long and these tools work well for only a subset of learners

The multipronged approach of this strategy attempts to address these blockers and limitations by offering both self-paced and guided learning opportunities, providing passive and active training opportunities, and offering resources that are varied in the literacy levels, depth of training, and time commitment required to complete the training (Figure 1).

Low Commitment

These resources require a relatively low learner time commitment (2 hours or fewer), and include:

Text/Image-based Content
- Water Boards Data Tool Kit
- Water Boards Data Community Forum Posts
- Presentation Slides
- Simple Guides/ How To's
- Infographics
- Short Articles and Whitepapers
- Online Blog/Forum Posts

Video/Audio-based Content
- Internal/External Webinars
- Short Educational Videos
- Video Demos/Tutorials
- Podcasts

Online Interactive Content
- Data Literacy Assessments
- Quizzes
- Business Intelligence Examples

In-person Content
- Brown-bags
- Educational Presentations
- Live Demonstrations
- Round table meetings
- Data related club meetings

Moderate Commitment

These resources require a moderate amount of learner time commitment (2 hours – 2 days), and include:

Text/Image-based Content
- Detailed Guides/ How To's
- Detailed Articles and Whitepapers
- Case Studies
- Books/eBooks

Video/Audio-based Content
- Detailed Educational Videos
- Pre-recorded Courses via Training Academy or External Sources

Online Interactive Content
- Workshops
- Live Online Courses

In-person Content
- Workshops
- Conferences, Symposia
- Individual Courses via Training Academy or External Sources

Extensive Commitment

These resources require a moderate amount of learner time commitment (3 days - months), and include:

Text/Image-based Content
- Books/eBooks

Video/Audio-based Content
- Detailed Educational Videos
- Pre-recorded Courses via Training Academy or External Sources

Online Interactive Content
- Workshops
- Live Online Course Modules

In-person Content
- Workshops
- Conferences, Symposia
- Course Modules via Training Academy or External Sources

Figure 1. Graphic illustrating the suite of training resources that will be made available to the workforce through the implementation of this Strategy.

Strategic Goals & Performance Measures

This Strategy establishes a framework for achieving our vision and goals that will help improve the way the Water Boards' workforce use and understand data and make decisions with information. The goals, corresponding activities (Figure 2), and performance measures listed below were developed based on Vyki Englert's (Principal and Co-Founder, Compiler LA) recommendations ([Appendix 2](#)) and will address the current blockers and limitations to data literacy at the Water Boards.

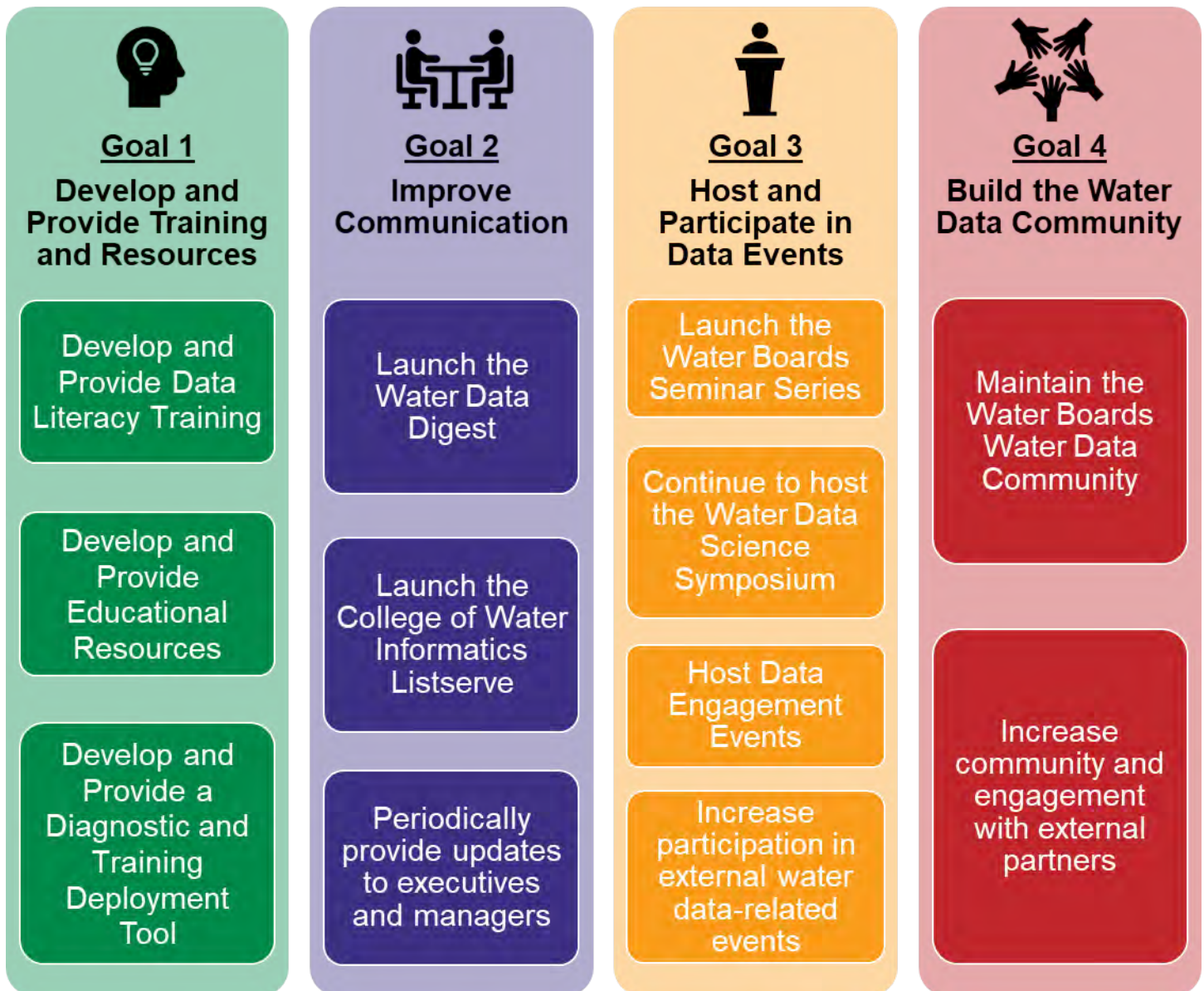| Goal 1 Develop and Provide Training and Resources	Goal 2 Improve Communication	Goal 3 Host and Participate in Data Events	Goal 4 Build the Water Data Community
Develop and Provide Data Literacy Training	Launch the Water Data Digest	Launch the Water Boards Seminar Series	Maintain the Water Boards Water Data Community
Develop and Provide Educational Resources	Launch the College of Water Informatics Listserve	Continue to host the Water Data Science Symposium	Increase community and engagement with external partners
Develop and Provide a Diagnostic and Training Deployment Tool	Periodically provide updates to executives and managers	Host Data Engagement Events	
		Increase participation in external water data-related events	

Figure 2. The four goals of this Strategy are shown with their respective activities.

Goal 1: Develop and Provide Training and Resources

Achieving the vision and mission of this Strategy will require the entire workforce to have access to training and resources that will help them develop the skills necessary to extract, transform, analyze and communicate data and information at different levels using different tools.

Current access to training curriculum is not sufficient for all learners to make progress. To support all learners, OIMA and the Data Literacy Strategy Development Team will partner with the Training Academy to develop, organize, and host training opportunities that include traditional classroom-based training as well as complementary self-guided training and educational resources. Moreover, the implementation of this goal and all related priorities will include a focus on developing resources to ensure learners are able to:

1. Gain experience in and take advantage of self-directed learning opportunities
2. Obtain support from supervisor to take time for skills development (see Goal 2, Activity 2.3)
3. Prioritize time for skills development work

Activity 1.1: Develop and Provide Data Literacy Training

Training courses will be hosted by the Training Academy or other free, self-directed sources. Achieving this priority will help staff learn about and build the skills they need to implement data literate practices into their regular work. Implementation of this priority will begin in Phase II.

<u>Performance Measures</u>

1. Courses offered

   a. A minimum of 6 data literacy related courses are offered in each fiscal year, where courses range in audience types and skill levels.

2. Enrollment numbers

   a. Courses within the Data Literacy curriculum have at least a 90% enrollment.

   b. Ensure equal and equitable access to courses and align access and enrollment with racial equity and social justice efforts underway at the Water Boards. Specific performance measures will be developed in Phase III.

3. Number of participants and views

   a. Capture participant information for live in-person, or remote/online classes, or views on custom made YouTube content. Track and increase the number of participants who view the webcast or YouTube links during and after the training.

   b. At least 66% of the Water Board workforce interacts with the resources provided.

4. Impact on retention and promotion

a. Investigate the ability to join class attendance with personnel records to evaluate the impact of training on retention and promotion compared to those individuals not enrolled in training programs. When evaluating retention and performance, special attention should be paid to gender, age, and race to track and prevent bias. Implementation of this metric will begin in [Phase II](#).

5. Data Literacy Survey

   a. Periodically distribute a data literacy survey similar to the 2019 Data Use and Skills Survey. These surveys will be re-distributed and evaluated to see whether and to what extent the training and resources have improved data literacy, addressed comfort with data systems and tools, or addressed other needs identified in the survey.

Activity 1.2: Develop and Provide Educational Resources

Educational Resources, such as the [Data Tool Kit](#) and the College of Water Informatics and OIMA Webpages, will help provide guidance for those who cannot or will not commit to a traditional training. Specifically, the College of Water Informatics will be used as a vehicle through which we will deploy data literacy training and resources. These educational resources will grow and evolve as we learn more about what the Water Boards workforce needs to complement or supplement available training. In addition to the more data literacy focused resources, we will also develop and structure these resources to help guide individuals who have little or no experience in self-directed learning.

A range of training and resource types and formats will be provided to meet learners where they are in terms of data literacy and time commitment so that even those with little or no experience with, or time for, data literacy related trainings can feel empowered to begin their journey to advancing their data literacy as their time and ability allows.

Training materials will be developed and customized, so they have direct application to the work of staff. Some examples of this include courses and resources for highly requested business intelligence tools, or a course that utilizes platforms or datasets that are specific to or frequently used by a Division, Region, or Program.

Performance Measures

1. Resource Development

   a. Develop resources, such as the [Data Tool Kit](#), that immediately respond to specific staff needs highlighted in the Data Use and Skill Survey. These resources are to be launched individually as they are ready and in [Phases](#) with time built in to evaluate the success and impact of the implementation.

2. Resource Availability

a. Publish all training recordings and resources on a publicly facing, searchable website, in an accessible format whenever possible, and in a timely manner (within three weeks of the training).

3. Resource Use

a. Establish a way to capture use of new resources (e.g. page analytics). Track page click analytics from known/internal IP addresses if possible.

b. Conduct an analysis of resource page analytics six months and one year after their launch; compare analytics of each resource to see which resources are the most used and to what extent use of the resources is changing.

Activity 1.3: Develop and Provide an On-demand Diagnostic Assessment and Training Deployment Tool

Another critical piece of this Strategy is the development and implementation of a Data Literacy Diagnostic Assessment that is customized to the Water Boards. After taking the Diagnostic Assessment, users need to be provided with recommended training and resources available to the Water Boards workforce (e.g. audiences, divisions, projects, teams, etc.), including decentralized, asynchronistic (i.e. ability for users to work through courses on their own schedule), in person and on-demand courses for all data literacy tracks and levels.

Performance Measures

1. Resource Development

a. Work with a contractor to develop an on-demand diagnostic assessment and training deployment tool that is customized to the Water Boards.

2. Resource Use

a. Distribute the Tool throughout the Water Boards. Continue advertising and distributing to the entire workforce until at least 75% have taken the Assessment at least one time.

Goal 2: Improve Communication Between OIMA and Water Boards Programs

Activity 2.1: Launch the Water Data Digest

This will address the comments from the Data Use and Skills Survey and other information gathering efforts about staff wanting to know more about what OIMA is doing through more frequent and transparent communication. The Digest will be used to advertise data events, training opportunities, data tools that have been developed for use by and for different programs, and to help build community at the Water Boards. At first this will mostly be one-way communication (i.e. OIMA

updating the workforce) but eventually, the objective is to use the Digest to encourage two⁺-way communication (i.e. everyone talking to each other).

Performance Measures

1. Number of Subscribers

    a. At least 85% of Water Board staff subscribe to the Water Data Digest. While this number is high, not all delivered emails are read and all staff will start subscribed and will need to take an action to unsubscribe.

Activity 2.2: Launch the College of Water Informatics Listserve

The College of Water Informatics listserve will provide another avenue through which Water Boards staff can stay informed of data literacy or College updates and activities. Additionally, the listserve will be open to the public, which will enable engagement and collaboration with external water agencies and groups.

Performance Measures

1. Number of Subscribers

    a. At least 85% of Water Board staff subscribe to the *Listserve*. While this number is high, not all delivered emails are read and all staff will start subscribed and will need to take an action to unsubscribe.

Activity 2.3: Periodically Provide Updates to Executives and Managers

This priority will not only improve communication pathways between OIMA and other divisions, but will also remind supervisors and management of the importance and benefits of providing support (in terms of time *and* resources) for staff to develop their data literacy and skills. Implementation of this activity will also support a focus of Goal 1: to ensure learners are able to obtain support from supervisor to take time for skills development.

Performance Measures

1. Present at the Division Management Committee (DMC) or the Management Coordinating Committee (MCC)

    a. Data literacy related items are presented to the DMC or the MCC at least twice per year.

2. Communicate relevant College of Water Informatics items to executives and management between presentations and as appropriate.

    a. Data literacy related updates are sent to executives and management at least four times per year (e.g. via the Executive Directors Report).

Goal 3: Host and Participate in Data Events

Achieving all the priorities in this Goal will:

1. Help the workforce learn about other people's work, challenges, successes, preferred tools, etc., and see what is possible.

2. Inspire some individuals to take up the challenge of trying out new (to them), data literate concepts, software, methods, tools, etc. in their work.

3. Provide discrete, "bite sized" opportunities for individuals to engage in conversations, challenges, or events and get hands on practice in encouraging and supportive environments.

Activity 3.1: Launch the Water Boards Seminar Series

The Seminar Series aims to promote the sharing of data-related products, tools, methods, and enthusiasm. Attending these seminars exposes the workforce to relevant research and networking opportunities in water data, science, research, and policy.

Performance Measures

1. Seminar frequency

    a. Host a minimum of one Seminar per month and include speakers from both inside and outside of the Water Boards.

2. Number of Attendees

    a. The average number of Seminar attendees over a quarter is at least 100.

Activity 3.2: Continue to Host the Water Data Science Symposium

The Water Data Science Symposium is a free, annual event that aims to enhance how water quality monitoring generates meaningful data to inform water management decisions.

Performance Measures

1. Water Data Science Symposium

    a. Host symposia at a frequency and with topics that are relevant to communities the Water Boards serves.

2. Attendee Makeup

    a. Strive to recruit attendees and speakers that reflect the communities the Water Boards serves. More specific metrics will be developed in Phase III.

3. Number of remote participants and views

a. Continue to increase the number of participants who view the webcast and the YouTube links during and after the event.

Activity 3.3: Host Data Engagement Events

Data engagement events, such as datathons and hackathons, gather subject matter experts and individuals with data science skills in a collaborative capacity and encourages them to work together to engage in exploratory, innovative, and creative problem solving.

<u>Performance Measures</u>
1. Frequency of events
    a. Host a minimum of one data engagement event per year.

Activity 3.4: Increase Participation in External Water Data-related Events

Engaging the workforce in external water data-related events gives them access to networking, collaboration, and learning opportunities that cannot be achieved by attending events that are only hosted by the Water Board.

Performance measures will be developed in Phase III.

Goal 4: Build the Water Data Community

Achieving all other goals will be critical for successfully achieving this goal and related priorities. The Microsoft (MS) Teams community and College of Water Informatics Listserve will be the tools through the below priorities are achieved. Building and consistently utilizing these lines of communication will help build support and the feeling of community; especially for those with little to no support from their supervisor or management. Achieving these priorities will empower the workforce so that everyone knows they can reach out to colleagues outside of their unit, program, or agency for help to figure out how to solve data problems themselves.

Activity 4.1: Maintain the Water Boards Water Data Community

The Water Data Community is meant to be a space for the data enthusiasts at the Water Boards to collaborate professionally but in an informal and flexible manner. The space helps participants connect with other data enthusiasts at different data literacy levels and in different Water Board programs, divisions, and regions. While the success of this space depends entirely on active participation, it is not meant to be burdensome. Anyone at the Water Boards is welcome to join the community on Microsoft Teams and engage when they can so that, together, participants can break

down old silos and build a data community that works for the workforce - at the Water Boards, for the Water Boards and by the Water Boards!

<u>Performance Measures</u>

1. Number of Community Members
    a. Increase the number of members by 10% of the workforce per quarter until at least 50% have joined.
2. Amount of Engagement
    a. Track the number of posts and engagement within the Water Boards Water Data Community. More specific metrics for success will be developed in Phase III.

Activity 4.2: Increase Community and Engagement with External Partners

Performance measures will be developed in Phase III.

Implementation

The successful implementation of this Strategy requires a phased approach, with each phase providing a suite of training and resources to the Water Boards workforce. We expect Phases I through Phase III (specifics described below) to be implemented by 2025, with the expectation that the long-term implementation of this Strategy will be iterative and evolving. We recommend revisiting the strategy after each phase and annually to make sure the implementation is on track, and every 5 years to update and modify the Strategy (e.g. add new phases) as more progress is made and the data literacy needs of the Water Boards evolves.

After this Proposal is approved, the Data Literacy Strategy Development Team expects Phases I, II, and III to be completed in six months, nine months, and four years, respectively (Figure 3).
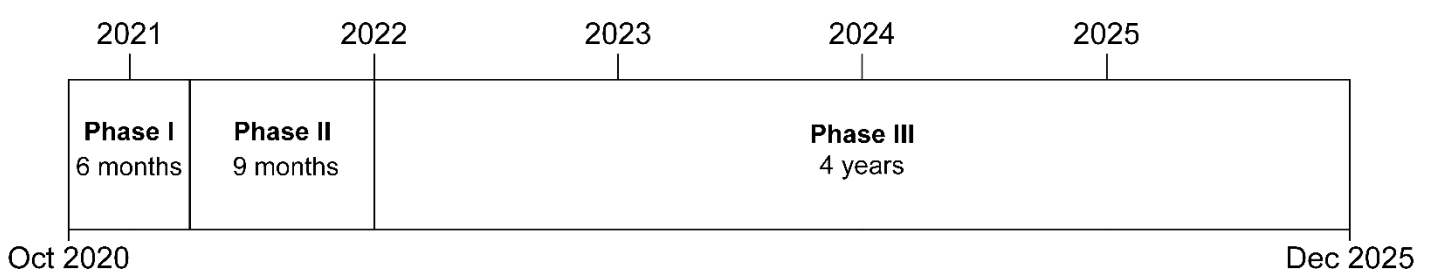

Figure 3. Data Literacy Strategy implementation timeline.

Phase I

October 2020 – March 2021 (6 months)

The combination of discussions with data users and the results of the [Data Use and Skills Survey](#) have made it abundantly clear that data users need and want to build their data literacy skills through formal and informal training. OIMA has begun to address this by developing and providing informal data science trainings (e.g. workshops, webinars, etc.) and resources (e.g. the [Data Tool Kit](#)). OIMA intends to continue to provide such services as well as launching new resources like the Water Data Digest and Seminar Series.

Additionally, OIMA will work with the Division of Information Technology (DIT) to develop a website for the Water Boards' College of Water Informatics. The website will be comprised of core pages describing the College's description, training resources, such as: The Data Tool Kit (informal resources), Course Catalog (formal resources), and Data Communities and Events

Specific deliverables during this phase include:

Goal & Priority	Deliverable	Timeframe	Lead Parties
Goal 1			
Priority 1	College of Water Informatics Website	3 months	OIMA, DIT
Priority 2	Including the compilation of free online data literacy training and resources.	3 months	OIMA, DIT
Goal 2			
Priority 1	Launch Water Data Digest	4 months	OIMA
Priority 2	College of Water Informatics Listserve	3 months	OIMA, DIT
Priority 3	Board briefing packages Executive and manager update materials	6 months	OIMA
Goal 3			
Priority 1	Launch Seminar Series	4 months	OIMA

Phase II

April 2021 – December 2021 (9 months)

Phase II will focus on the assessment of products and progress made during Phase I and adjusting as needed. During Phase II efforts will shift away from launching new resource infrastructure (e.g. College of Water Informatics, Seminar Series, Water Data Digest) and towards developing new training and resources that are customized for the Water Boards workforce.

During Phase II, OIMA will partner with the Training Academy to provide a suite of highly requested introductory training courses to Water Board staff in key data science areas and launch a Data Literacy Diagnostic Assessment.

Specific deliverables during this phase include:

Goal & Priority	Deliverable	Timeframe	Lead Parties
Goal 1			
Priority 1	Training Academy proposal	2 months	OIMA, Training Academy
	Courses and advertising	9 months	OIMA, Training Academy
Priority 2	College of Water Informatics (CoWI) Website and resource Updates	9 months	OIMA, DIT
Goal 2			
Priority 1	Water Data Digest analytics assessment	1 month	OIMA
	Water Data Digest maintenance	9 months	OIMA
Priority 2	CoWI Listserv assessment	1 month	OIMA
	CoWI Listserv maintenance	9 months	OIMA
Priority 3	Board briefing packages Executive and manager update materials	9 months	OIMA
Goal 3			
Priority 1	Seminar Series assessment	1 month	OIMA
	Seminar Series maintenance	9 months	OIMA
Priority 2	Water Data Science Symposium	6 months	OIMA
Priority 3	Datathon(s)	9 months	OIMA
Priority 4	Partner event advertising resources	9 months	OIMA
Goal 4			
Priority 1	MS Teams Data Community assessment	1 month	OIMA
	MS Teams Data Community maintenance	9 months	OIMA
Priority 2	Partner engagement resources	9 months	OIMA
Assessment	The second Data Use and Skills Survey	9 months	OIMA

Phase III

January 2022 – December 2025 (4 years)

Phase III will focus on the assessment of products and progress made during Phase II and adjusting as needed. During Phase III efforts will shift away from maintaining new resource infrastructure (e.g. College of Water Informatics, Training Courses, Seminar Series, Water Data Digest) and towards creating or improving organizational infrastructure to improve the long term data literacy development, accessibility, availability, and equity at the Water Boards.

Specific deliverables during this phase include:

Goal & Priority	Deliverable	Timeframe	Lead Parties
Assessment	Analysis and visualization of the second Data Use and Skills Survey (or similar surveys)	1 month Repeat as appropriate	OIMA
Goal 1			
Priority 1	Training Academy courses assessment	1 month	OIMA, Training Academy
	Training Academy proposal (new courses)	2 months	OIMA, Training Academy
	New courses and advertising	6 months Repeat as needed	OIMA, Training Academy
Priority 2	College of Water Informatics Website Updates	Repeat quarterly or as needed	OIMA, DIT
Priority 3	Analysis and visualization of Data Literacy Diagnostic Assessment findings	1 month	Consultant, OIMA
	Data Literacy Diagnostic Assessment maintenance	Continuous	Consultant, OIMA
Goal 2			
Priority 1	Water Data Digest analytics assessment Water Data Digest maintenance	Repeat quarterly or as needed	OIMA
Priority 2	CoWI Listserv assessment CoWI Listserv maintenance	Repeat quarterly or as needed	OIMA
Priority 3	Board briefing packages Executive and manager update materials	Repeat annually or as needed	OIMA

Goal & Priority	Deliverable	Timeframe	Lead Parties
Goal 3			
Priority 1	Seminar Series assessment Seminar Series maintenance	Repeat quarterly or as needed	OIMA
Priority 2	Water Data Science Symposium	Repeat annually	OIMA
Priority 3	Datathon(s)	Repeat annually	OIMA
Priority 4	Partner event advertising resources	Repeat quarterly or as needed	OIMA
Goal 4			
Priority 1	MS Teams Data Community assessment MS Teams Data Community maintenance	Repeat quarterly or as needed	OIMA
Priority 2	Partner engagement resources	Repeat quarterly or as needed	OIMA
Assessment	The third Data Use and Skills Survey (or similar surveys)	Repeat as needed	OIMA

Budget

The majority of the budget and resources used to implement this Strategy will come from in-kind services or contributions from OIMA and partners (e.g. staff time). As additional funds, staff, and contract resources become available, the Data Literacy Strategy Development Team will revisit the Strategy and take advantage of opportunities to achieve existing goals faster or build out additional resources (e.g. develop more courses, improve the assessment and deployment tool, etc.).

Appendix 1: Insights from 2019 Data Use and Skills Survey

A qualitative synthesis of the two text area fields in the 2019 survey yielded the following insights:

- The strongest self-identified needs are for Excel and R, with little interest in specific Business Intelligence (BI) tools. (Data Strategy Development Team noted that outside of survey respondents there is a tremendous interest in learning how to visualize data using BI tools).

- Some self-awareness of lack of data literacy is present.

- Many staff indicate need for trainings that are domain specific, not general.

- There is a lack of understanding of what data are available to staff and how to access those data.

- A significant number of respondents asked about creating new positions for individuals with data skills.

- Specific requests for advanced tools: MATLAB, DPlot, scientific journal access, JMP, etc.

- Several individuals asking about the Water Boards presence on GitHub and connecting with peers by browsing their GitHub repositories.

- The Division of Administrative Services' Accounting Office needs/wants excel training.

- There were several questions and comments about data quality and process improvements to data collection.

- There were more than seven mentions for a better understanding of training in creating Americans with Disabilities Act (ADA) compliant documents.

    - Note: The Data Literacy Strategy Development Team is not addressing this request since efforts are currently underway to do so by the Training Academy and others.

- There were strongly articulated requests to better understand what data management efforts are happening across the Water Boards.

Appendix 2: Vyki Englert Data Literacy Strategy Recommendations

Phase I

Communicate

- Establish a new channel for communicating data management, governance, training, and resource updates and progress. This needs to have a place of record for a searchable and browsable archive, and the option to subscribe to new posts. Likely this will be an internal email list to start, cross posting in Microsoft Teams.

- Content for Phase 1:

    - Periodic updates on data management and data governance at the Water Boards from OIMA.

    - Announcements or updates on new data literacy and skills training and resources.

    - Share-out links to free off-the-shelf training as a small set of mini profiles on members of the broader community and for each their personal recommendation for a tutorial or resource. This will make the content personal and relatable, where the full list can feel overwhelming.

    - Share-out links to the [Water Boards GitHub organization](#), with instructions on how to request to join, and then setting membership to public to discover each other. Members of this team should consider setting the GitHub membership to public.

    - Share-out the request for ADA compliant document training was heard via survey. Share status of training for meeting ADA compliance that is being completed by another team outside of OIMA and include instructions for enrollment if available.

    - Announce virtual events such as brown-bags or webinars.

Document

- Updated written guide to Water Boards datasets and databases with mini video tutorials on accessing the data and loading it into various tools for analysis. For Phase 1, this means most likely expanding and rearchitecting the content on [OIMA's Data and Databases webpage](#). Videos should be unlisted on YouTube if there are no privacy/security concerns. *This type of information becomes stale quickly, so finding ways to integrate it into workflows, or scheduling time to review and update it is recommended. Could this be tied to a GitHub repo so folks can request/ submit feedback via issues? Provide transparency on improvements. Information architecture could include moving [flat files to data.ca.gov](#). Also need to run link checker.*

- A periodically updated written guide to what data tools the Water Boards has enterprise licenses for and what recommended open-source or free data tools are available (example R, R Shiny). Much of this already exists on the [Data Tool Kit intranet site](#). However, this needs to

be updated for comprehensiveness and accurate contact information. It may also be useful to include what paid tools the agency does not use, (i.e., MATLAB, JMP) and suggest alternatives. Include messaging here about values and extending the value of public dollars by choosing open-source software and tools.

- Document existing recommended free off-the-shelf training materials (i.e. Data Tool Kit).
    - Trainings for beginner, intermediate, and advanced Excel.
    - Trainings for beginner, intermediate, and advanced R (using the high quality, free tutorials from RStudio).
    - Trainings for beginner, intermediate, and advanced R Shiny (using the high quality, free tutorials from RStudio).
    - Trainings for beginner, intermediate, and advanced Python (using the high quality, free tutorials).
    - Trainings for beginner, intermediate, and advanced BI Software, such as Microsoft Power BI, Tableau (using the high quality, free tutorials from the corresponding Software's tutorials).

Develop

- Events
    - Consider hosting internal showcases of 5+ min presentations on internal data products using Water Boards data and real work examples.
        - "I think we should revive the historical brown bag events and call it a seminar series, where we include showcases like this, as well as demos, and general symposium-style talks from internal and external speakers."
- Custom content
    - Likely only 1-2 units as webinars for this phase.

Measure

- Establish appropriate metrics for measuring enrollment and success. This might be best done as a BI dashboard.
    - Look to the [training performance dashboard used by Data SF](#), and build in additional metrics that reflect the values of the Water Boards. Similar to the Data SF Dashboard and curriculum, these materials should be published on the open web.
- At the completion of Phase 1, administer the Data Use and Skills Survey again, with updates that capture some of the qualitative feedback from first survey.

Phase II

Communicate

- Content for Phase 2:
    - Periodic updates on the status and progress of data management and data governance guidance and resources at the Water Boards from OIMA.
    - Announcements or updates on new data literacy and skills training and resources.
    - Continue to share-out links to free off the shelf training as a small set of mini profiles on members of the broader community and for each their personal recommendation for a tutorial or resource. This will make the content personal and relatable, where the full list can feel overwhelming.
    - Announce virtual events such as brown-bags or webinars.
    - Announce new learning tracks (see Document section below for more details).
    - Share links to relevant externally sponsored resources, such as the California Data Collaborative conference.

Document

- Update written guide to Water Boards datasets and databases as needed.
- Update written guide to available data tools at the Water Boards as needed.
- Develop learning tracks for example:
    - Data Governance (Decisions, Publication, Collection)
    - Data Management (Databases, data lakes, ETLs, APIs, Hosting)
    - Data Analysis and Data Science
    - Data Visualization
    - Data Privacy & Security
- Organize training into learning tracks that move from beginner to advanced.

Develop

- Create new content and release.
    - Continue webinars from Phase 1.
    - Begin creating first tutorial type content through the Training Academy.
        - Custom beginner, intermediate, advanced R tutorials using Water Boards data and real case studies (source ideas from showcase).
        - Custom Excel tutorials or demonstrations using real staff work examples.

- Explore offering more hands-on options based on budget and staff engagement such as: Cohort learning, coaching, Live online or in-person trainings, office hours program.

Measure

- Review progress and engagement of Phase 1 materials.
- Review results of the updated Data Use and Skills Survey.
- At the completion of Phase 2, administer the Data Use and Skills Survey again, with updates that capture some of the qualitative feedback from the last survey.
- Update metrics with new measure(s), as appropriate.

Phase III+

Communicate, Document, Develop

- Continue work to Communicate, Document, and Develop from previous phases.
- Continue measuring and communication activities, investing in developing new content.
- Work with the Training Academy to convert new tutorials into Academy-based curriculum.
- Work with the Training Academy to develop new content based on staff needs.
- Potentially introduce enterprise skills development software.
- Expand data literacy program to include external audiences.
- Formally join the California Data Collaborative to support professional development of staff.
- Develop mentorship programs for supporting staff in public speaking and teaching workshops to external audiences
- Add in-person training content, as appropriate.
- Review this Data Literacy Strategy and amend as needed based on progress made and new data literacy needs of the Water Boards.

Measure

- Review progress and engagement of Phase 2 materials.
- Review results of the updated Data Use and Skills Survey.
- At the completion of Phase 3, administer the Data Use and Skills Survey again, with updates that capture some of the qualitative feedback from the last survey.
- Update metrics with new measure(s), as appropriate.