DACUM Research Chart for Data Collection and Analysis Function

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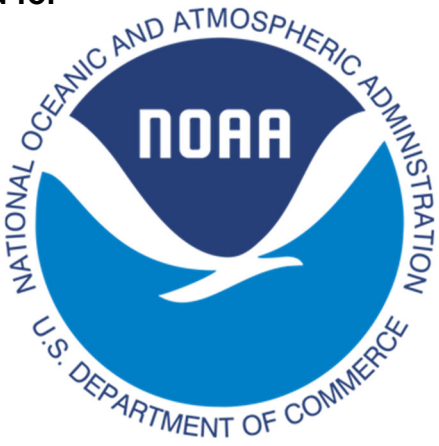

DACUM Observers
Max Herzog, Cleveland Water Alliance
Lorrayne Miralha, Ph.D., OSU
Diane Quimper-Balliett, Cleveland Water Alliance

8 duties & 110 tasks

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DACUM Panel
Hannah Boesinger, Northeast Areas of Concern Coordinator
Ohio Lake Erie Commission
Cleveland, OH

Andriana Hays, Stormwater Inspector
Northeast Ohio Regional Sewer District
Cuyahoga Heights, OH

Leila Jackson, GIS Project Manager
Northeast Ohio Regional Sewer District
Cleveland, OH

Steven McMurray, Research Coordinator/ Natural Resources Admin I
Old Woman Creek NERR, ODNR
Huron, OH

Dan Murphy, Flow Monitoring Technician
Northeast Ohio Regional Sewer District
Cuyahoga Heights, OH

David Perry, Chief Technology Officer
54 Mobile Laboratories, LLC
Akron, OH

Paul Skerl, Laboratory Pretreatment Coordinator
City of Rocky River WWTP
Rocky River, OH

Justin Telep, Field Biologist
Northeast Ohio Regional Sewer District
Cuyahoga Heights, OH

DACUM Facilitation Team
Kate Fergus, OSU
Tricia Hughes-Fitzgerald, OSU
Traci Lepicki, OSU
Bobbie Sin, OSU

DACUM Research Chart for Data Collection and Analy

DUTIES	TASKS			
A. Perform Project* Planning	A.1 Determine project objectives (e.g., goals, hypothesis, outcomes)	A.2 Obtain management approval	A.3 Assemble project coordination team	A.4 Coordinate with project partners and stakeholders
	A.10 Establish data collection schedule	A.11 Create data management plans (e.g., study plan, retrieval, storage)	A.12 Create QA/QC plan	A.13 Develop data analysis plan
	A.19 Determine safety plans			
B. Maintain Supplies & Equipment	B.1 Purchase supplies and equipment	B.2 Maintain spare part and supply inventory	B.3 Test technical equipment (e.g., instruments, meters, motors)	B.4 Troubleshoot technical equipment
C. Conduct Field Work	C.1 Determine sampling requirements	C.2 Confirm field work permissions	C.3 Determine site access locations	C.4 Gather field work supplies and equipment (e.g., bottles, paperwork, preservatives)
	C.10 Conduct field inspections (e.g., hydraulic, structural, debris)	C.11 Conduct environmental field assessment (e.g., biological, habitat, plant/animal)	C.12 Collect field samples	C.13 Coordinate sample processing with lab (e.g., chain of custody, schedule, hold times)
D. Analyze Field Samples	D.1 Complete sample chain of custody	D.2 Subdivide field samples	D.3 Store field samples	D.4 Prepare sample per intended analysis
	D.10 Maintain laboratory glassware (e.g., clean, sterilize)	D.11 Re-analyze anomalous results	D.12 Ship samples for commercial analysis	D.13 Input data into secure information management system
E. Conduct Data Analysis and Interpretation	E.1 Compile project data and metadata	E.2 Create data optimization resources (e.g., scripts/macros, programs, templates)	E.3 Prepare data for analysis (e.g., clean, sort, filter)	E.4 Perform data exploration (e.g., compute summary statistics, initial visual representation, data gaps)
	E.10 Evaluate data and analysis outcomes (e.g., hypothesis, future data needs)	E.11 Obtain stakeholder feedback (e.g., peer review, public comment)	E.12 Address stakeholder feedback	E.13 Finalize project report

sis Function

March 10 & 11, 2025

A.5 Obtain project funding (e.g., grant funds, budget, milestones)	A.6 Review historical data (e.g., reports, as -builts, video footage)	A.7 Obtain work permits/property permissions	A.8 Determine project methodologies (e.g., sampling, assessment, testing)	A.9 Identify data collection sites
A.14 Create project assets (e.g., templates, forms)	A.15 Determine project resource requirements (e.g., tools, tech, staff)	A.16 Identify project-specific training and development needs	A.17 Delegate project tasks	A.18 Develop project evaluation plan (e.g., deliverables, model confirmation, timeline)
B.5 Repair malfunctioning tools and equipment	B.6 Perform equipment preventative maintenance (e.g., clean, batteries, fuses)	B.7 Maintain equipment records	B.8 Assemble technical equipment	B.9 Update equipment firmware and software
C.5 Verify equipment calibration	C.6 Provide field work information to public	C.7 Gather site information from public	C.8 Install monitoring equipment	C.9 Collect in situ measurements
C.14 Restore work area to original condition	C.15 Verify industrial self-monitoring reports	C.16 Report nuisance conditions	C.17 Document field data (e.g., scan, transcribe, upload)	
D.5 Prepare test reagents and standards	D.6 Analyze biological samples (e.g., identify, quantify, specify)	D.7 Conduct chemical analysis (e.g., instrumental, wet chemistry)	D.8 Verify quality control checks (e.g., standards, blanks)	D.9 Maintain lab environment (e.g., temperature, humidity, cleanliness)
E.5 Conduct statistical analysis (e.g., test hypothesis, identify trends and relationships)	E.6 Develop predictive models (e.g., test, validate, calibrate)	E.7 Perform data interpretation (e.g., standards, models, targets)	E.8 Perform data visualization (e.g., figures, tables, maps)	E.9 Create draft report

DACUM Research Chart for Data Collection and Analy

DUTIES	TASKS			
F. Disseminate Project Results	F.1 Present results at conferences	F.2 Participate in public dialog activities (e.g., public meetings, public comment periods, open houses)	F.3 Develop community outreach materials (e.g., flyers, signage, report cards)	F.4 Deliver required reports (e.g., internal, external)
	F.10 Recommend on-site optimizations/ process improvements	F.11 Support regulatory compliance and enforcement activities	F.12 Support data-driven management decision-making (e.g., new projects, policy, funding)	F.13 Patent project discoveries
G. Maintain Data Integrity	G.1 Develop SOPs (e.g., calibration, sampling, cleaning)	G.2 Perform equipment calibration (e.g., lab, field, safety)	G.3 Coordinate third-party equipment calibration	G.4 Retain project records
	G.10 Protect sensitive/ proprietary data	G.11 Qualify laboratory data	G.12 Perform proficiency testing (e.g., annual, DOC)	G.13 Maintain testing materials (e.g., standards, reagents, weights)
H. Maintain Safe Work Practices	H.1 Review safety documentation (e.g., SDS, emergency plan, health and safety plan)	H.2 Maintain safety equipment (e.g., lab, field, vehicle)	H.3 Dispose of lab waste/chemicals	H.4 Maintain chemical storage
	H.10 Participate in safety initiatives (e.g., near miss, recommend improvements)	H.11 Complete safety documentation (e.g., CSE, safety surveillance)		

Project may refer to, but is not limited to, the following activities:

Assignments
Infrastructure maintenance/improvements
Inspections
Investigations
Regulatory compliance activities
Research
Testing

About this Project

This chart was prepared by The Ohio State University using Federal funds under award NA24OARX417C0524 from National Oceanic and Atmospheric Administration's National Sea Grant College Program, U.S. Department of Commerce. The statements, findings, conclusions, and recommendations are those of the author(s) and do not necessarily reflect the views of the National Oceanic and Atmospheric Administration's National Sea Grant College Program or the U.S. Department of Commerce.

For additional information on this project, please contact **dacum@osu.edu**.

F.5 Share findings online (e.g., web, blog, social media)	F.6 Develop public-facing data visualizations (e.g., dashboard, story maps)	F.7 Prepare press releases	F.8 Publish project data online	F.9 Prepare project publications (e.g., peer-reviewed journal, technical)
G.5 Maintain lab certification	G.6 Verify proper collection procedures (e.g., data, samples)	G.7 Perform data integrity/QC tests	G.8 Perform lab/field intercomparisons	G.9 Perform MDL studies
G.14 Develop unbiased review process	G.15 Perform routine data backup			
H.5 Complete safety trainings and certifications	H.6 Don PPE (e.g., lab, field)	H.7 Deploy safety measures (e.g., fall protection, air monitoring, traffic)	H.8 Monitor environmental conditions (e.g., weather, stream flow, hazards)	H.9 Perform LOTO

Acronyms

ADCPs	Acoustic Doppler Current Profilers
ADS	Advanced Design System
BEHI	Bank Erosion Hazard Index
CSE	Confined Space Entry
DI	Deionized
DOC	Demonstration of Capabilities
EPA	Environmental Protection Agency
GC-MS	Gas Chromatography–Mass Spectrometry
GIS	Geographic Information System
GPS	Global Positioning System
HAZCOM	Hazard Communication
HAZMAT	Hazardous Materials
ISO	International Organization for Standardization
LC-MS	Liquid Chromatography–Mass Spectrometry
LOTO	Lock Out Tag Out
MDL	Minimum Detection Limit
NBS	Near Bank Stress Assessment
NEC	National Electrical Code
NFPAE	National Fire Protection Association Standard for Electrical Safety in the Workplace (NFPA 70E)
NRCS	Natural Resources Conservation Service
OSHA	Occupational Safety and Health Administration
PDMS	Plant Design Management System
PPE	Personal Protective Equipment
QA/QC	Quality Assurance/Quality Control
RCA	Root Cause Analysis
RoHS	Restriction of Hazardous Substances
SDS	Safety Data Sheets
UV/VIS	Ultraviolet-visible

General Knowledge and Skills

Knowledge

- Analytical chemistry
- Basic biology
- Basic chemistry
- Basic field safety
- Basic geology
- Basic lab safety
- Basic mass-spectrometry
- Basic physics
- BEHI
- Biological processes
- Calibration types and procedures
- Chemical properties
- Clean room best practices
- Company protocols and procedures
- Data management
- Data synthesis/analysis
- Dataloggers
- Documentation practices and requirements
- Electrical systems
- Environmental sensors
- Generators
- Geomorphology
- GIS
- HAZMAT/HAZCOM
- Hydrology
- Industry standards (e.g., NFPAE, NEC, ISO 9001)
- Industry terminology
- Lifting techniques/ergonomics
- Machine learning methods
- Manufacturing processes
- Material properties
- Math (e.g., geometry, trig, stats, algebra)
- Measuring erosion
- Natural sciences
- NBS Assessment
- Organizational structure
- Precision measurement
- Process flows
- Programming languages
- QA/QC practices and requirements
- RCA
- Regression methods
- Regulations/compliance (e.g., OSHA, EPA, RoHS)
- Safety protocols and procedures
- Sampling methodology
- Spreadsheets
- Statistical software
- Stream mechanics
- Troubleshooting methodologies (e.g., 5-Y, fishbone)
- Unit conversions (standards, metric)
- Utilities (gas, electric, water)
- Wet chemistry

Skills

- Analysis
- Boating
- Coaching
- Communication (written, verbal, non-verbal)
- Computer proficiency
- Conduct condition assessments
- Create dashboards
- Create public outreach materials
- Critical thinking
- Customer service
- Data collection/analysis
- Data entry
- Data visualization
- Dataloggers
- Decision-making
- Driving
- Environmental data collection
- Environmental sensors
- Evaluation
- Fluid dynamics
- Form development for data collection
- GIS
- Identify areas of concern
- Modeling
- Observation
- Office software
- Planning
- Print/schematic reading/interpretation
- Prioritization
- Problem solving
- Project management
- QA/QC
- Risk assessment
- Spatial awareness
- Species identification
- Statistical analysis
- Statistics
- Systems thinking
- Technical writing
- Time management
- Training
- Troubleshooting
- Unit conversions
- Wire repair
- Wire splicing
- Working in all weather conditions

Tools, Equipment, Supplies, Materials

Field

100' measuring tape
2-way radio
4 gas meter
ADCPs
Air monitoring equipment
Area velocity sensors
Backup charger
Bank pins
Batteries
Boat
Boots
Bucket
Bug spray
Buoys
Clinometer
Clipboard
Concrete drill bits
Concrete hammer drill
Confined space equipment (winch, harness, helmet, tripod)
Cooler
Crete wedge anchors
Desiccant
Drone
Electrofishing supplies
Environmental sensors
Extra clothes
Field sheets
Filters
Flashlight
GoPro
GPS
Hard measuring tape
Ice
Inflow velocity probe
Laptop/tablet
Macroinvertebrate sampling supplies
Measuring tools
Office supplies
PPE
Ratchet set
Sample containers
Socket set
Spare drill batteries
Surface velocity radar gun
Surveyor's tools
Syringes
Telemetry systems
Trail cameras
Ultrasonic
Waders
Water level sensors
Water quality sondes
Wrench set
Zip ties

Lab

Acid bath
Acids (e.g., hydrochloric, nitric, sulfuric)
Autoclave
Autosampler
Autosampler fridges
Balances
Bases (e.g., sodium hydroxide, potassium hydroxide)
Beakers
Calculator
Centrifuges
Clipboard
Conductivity meter/probe
Dissolved oxygen meter/probe
Distilled/DI water
Document/report templates
Dry ovens
Erlenmeyer flask
Evaporating dishes
Filter paper
First aid kit
Freezers
GC-MS
Glass pipettes
Glassware
Gloves
Infrared spectrometer
Instrumentation
Isopropyl alcohol
LC-MS
Micropipettes
Muffle furnace
Notebooks
pH buffers
pH meter/probe
Pipette bulbs
Reagents
Refrigerators
Safety glasses
Separatory funnels
Solutions
Spectrophotometers
Standards
Storage room
UV/VIS spectrometer
Vacuum filtration unit
Volumetric flasks
Water baths
Weights

Software

ADS
Excel
GIS
Hydrosphere
Machine learning
Mat Lab
MS Office
PDMS
Predictive modeling
Python
Qstart
RStudio
SigmaPlot

Web Apps

Arc GIS online
NearMap
NRCS Soil Survey
Stream Stats
Survey123
Teloggers for Windows

Future Trends and Concerns

- Be open to the various environmental careers
- Changing technology (e.g., lack of batteries, software programs)
- Changing physical environment: species extinction, invasive species, and impacts of climate change
- Challenge finding folks who are able or willing to work a full day doing field work, especially during hot/cold temperatures
- Covid-era lack of field work opportunities
- Data security
- Engineering projects for a climate adaptive environment
- Existing models are no longer accurate; need to revise models to keep up with rapidly changing conditions (e.g., flood, stormwater planning)
- Fewer younger people pursuing field work
- Funding concerns and uncertainty
- Importance of programming in training programs
- Increasing automation of some processes
- Introduction to field work: early, often, and authentic experience
- Lack of manufacturer support for tools and equipment
- Lack of value of scientific literacy in teaching and among the public
- Machine learning impacting data analytics
- More extreme climate events (flooding, droughts, fires)
- Need to value critical thinking in education
- Political priorities impacting jobs, funding, and environmental protections
- Promoting field work to individuals with interests in seemingly unrelated topics (hands-on learning, building, construction)
- Public mistrust of sound science
- Public perception of scientific funding for research and suspicion of motives
- Set realistic pay expectations
- Staffing concerns: finding and retaining talent
- Stress importance of training in field work
- Value in advocating for funding and policies (e.g., congressional testimony)
- Work/life balance
- Younger folks are less comfortable using desktop computers

Worker Behaviors

Coachable
Consistent
Culturally-sensitive
Curious
Decisive
Detail-oriented
Disciplined
Emotionally intelligent
Ethical
Flexible
Goal-oriented
Honest
Hygienic
Motivated
Not claustrophobic
Organized
Patient
Positive
Professional
Resilient
Tactful
Team player
Thorough
Trustworthy
Unbiased

Alternative titles associated with this job include, but are not limited to:

Advanced Instrumentation Chemist
Aquatic Biologist
Aquatic Ecologist
Biological Science Technician
Biologist
Chemist
Environmental Biologist
Environmental Specialist/Scientist
Field Biologist
Field Chemist
Fish Biologist
Flow Monitoring Technician
Geologist
Hydrogeologist
Hydrologist
Lab Analyst
Laboratory And Pretreatment Coordinator
Laboratory Technician
Monitoring Coordinator
Natural Resources Technician
Physical Scientist
Research Biologist
Research Coordinator
Senior Wastewater Analyst
Specialist And Instrument Technician
Stream Restoration Ecologist
Wastewater Analyst
Water Quality Technician
Watershed Program Manager

About the Process

This analysis of the Data Collection and Analysis function was conducted using a process called DACUM. DACUM is an acronym that stands for **D**eveloping **a** **C**urricul**um** because it is the *foundation* of the program/curriculum development process (not the actual curriculum).

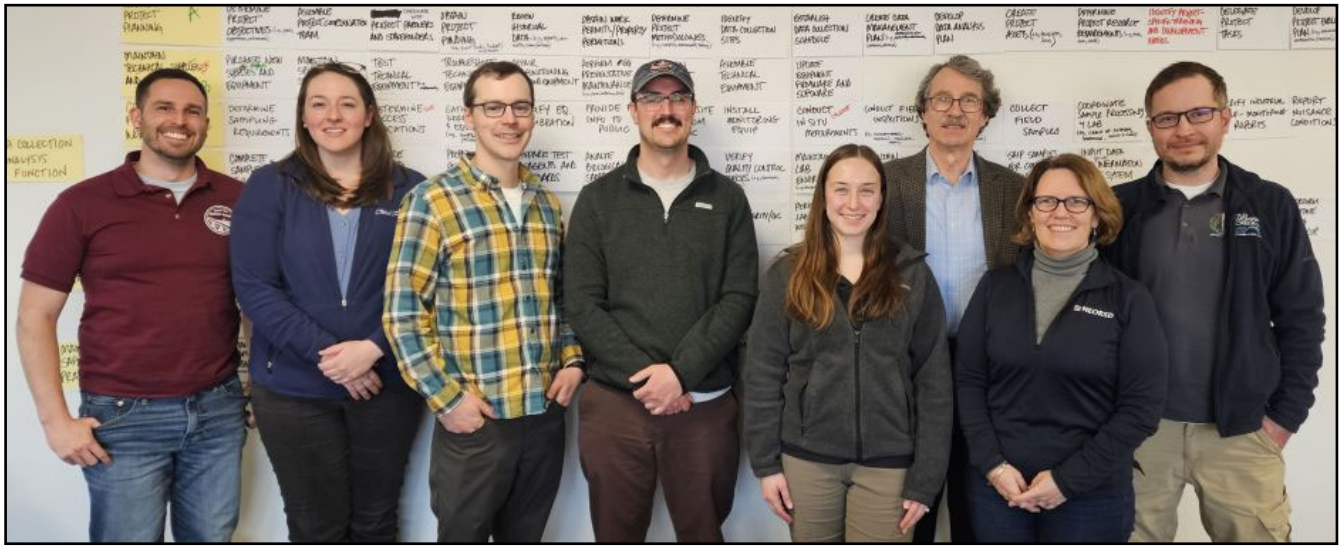
The process uses subject matter experts in the job as panelists who were selected by The Ohio State University's Center on Education & Training for Employment after being recommended for participation by a representative from their organization via the Employer Needs Assessment Survey.

The panel works under the guidance of a team of trained facilitators for two days to develop the DACUM Research Chart. The chart contains a list of general areas of competence called DUTIES and multiple TASKS for each duty. Brainstorming techniques are used to obtain the collective expertise and consensus of the panel. As the panel determines each task, it is written on a card which is then attached to the wall in front of the panel. The completed chart is a graphic profile of the duties and tasks performed by the panel members.

The panel also identifies the general knowledge and skills required to perform the tasks they identified, the tools, equipment, supplies and materials used, the important worker behaviors essential for success, and the future trends and concerns regarding the job.

The process is used internationally to ensure that new curricula being developed aligns precisely with what employees in business and industry actually do on the job. This DACUM workshop was conducted by a team of experienced OSU facilitators.

To learn more about the DACUM methodology for job and occupational analysis, as well as CETE's suite of workforce development and professional learning solutions, please visit **cete.osu.edu**.



DACUM subject matter experts pictured from left to right: Paul Skerl, Hannah Boesinger, Justin Telep, Dan Murphy, Andriana Hays, David Perry, Leila Jackson, and Steven McMurray.