

AWS COST · SAMPLE DELIVERABLE

Spend Baseline and Inventory

Week 1 of 6: Baseline and inventory · prepared for Copperwick Therapeutics, Inc.

Prepared by Charles Sieg · charles.sieg@vantalect.com · vantalect.com

February 27, 2026 · AWS Cost Analysis & Optimization: The Optimization (six weeks)

SAMPLE DELIVERABLE

This is a sample deliverable. Copperwick Therapeutics, Inc. is a fictional company: its people, programs, products, accounts, and figures are invented for this sample, and any resemblance to a real company, person, program, or medicine is coincidental. AWS prices are list prices from the AWS Price List API retrieved on October 13, 2026, and from the public AWS Price List bulk API on October 17, 2026; Spot prices are 30-day means for September 14 to October 14, 2026.

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Executive summary

Copperwick's in-scope AWS bill is **\$1,623,688 a month** at the February 2026 run rate, or **\$19,484,251 a year**, across 48 of the company's 212 AWS accounts. Those are list prices after the existing Savings Plan's discount and before Copperwick's 6% private pricing discount, which

takes what Copperwick pays for these accounts to **\$1,526,267 a month**, or \$18,315,196 a year. AWS Enterprise Support is billed on the whole organization and is in neither figure ([Enterprise Support](#)).

This report is the baseline. It prices nothing for savings, because the first week of an engagement answers a different question: what does the bill consist of, who runs each part of it, and what are the rules for changing it? In a research estate that is under validated systems, the last part decides most outcomes. Dr. Lorraine Osei set four ground rules for GxP systems on the first day, and every finding in the reports that follow carries a class that comes from them ([The GxP ground rules, the freezes, and change control](#)).

What you most need to know from week 1:

- 1. Three service groups are \$1,110,917 a month, more than two-thirds of the bill.** EC2 compute is \$782,084 a month (48.2%), S3 is \$197,966 (12.2%), and EBS is \$130,867 (8.1%) ([Spend by service group](#)).
- 2. The bill grew 20.5% in eleven months, in steps that match science.** It went from \$1,318,400 in February 2025 to \$1,589,100 in January 2026, and the February run rate is \$1,623,688. The two largest steps, \$64,400 in June 2025 and \$51,700 in September 2025, came with the p4d training fleet and the move of cryo-EM processing to AWS ([Twelve months of spend](#)).
- 3. A research bill tracks experiments, not seasons.** Cost per genome, per cryo-EM campaign, and per training run says more than month over month, and the later reports measure the work that way where they can ([Twelve months of spend](#)).
- 4. 11 of the 48 accounts are validated and 6 more are qualified infrastructure.** The validated systems' own lines come to \$140,591 a month, 8.7% of the bill. Their changes go through change control, and two freezes close part of the calendar ([The GxP ground rules, the freezes, and change control](#)).
- 5. Some of the estate is already well run, and the reports say so.** The EKS research analytics platform (\$312,000 a month, 19.2% of the bill) already runs on Karpenter, Spot, and Graviton. The existing three-year Compute Savings Plan is fully used and saves \$106,413 a month. The Direct Connect ports are sized to the instrument uploads they carry ([What is already done well](#)).
- 6. A private pricing agreement sits under everything.** A flat 6% discount on eligible usage and a \$27 million a year commitment, net of the discount, run to June 30, 2027. The whole organization spends \$34,964,476 a year net, \$7,964,476 above the commitment ([The private pricing agreement](#)).

How to read the dollar figures

Every figure is U.S. dollars per month unless it says "a year." The February 2026 run rate is the estate as it stood on February 23, 2026, priced for a 730-hour month at AWS list prices for US East (N. Virginia), with US West (Oregon) for the disaster-recovery replicas; the notice at the front of this report names the dates the prices were retrieved. The figure is after the existing Savings Plan's discount and before the private pricing discount. From the readout on, savings and the guarantee's gate are net of that discount, because it is what the bill falls by; list-price figures appear only as context and are labeled "at list." Enterprise Support is shown on its own and is not in the in-scope total. Savings are not ranked in week 1; week 2 ranks them.

The baseline at a glance.

Measure	Value
February 2026 run rate, per month, at list	\$1,623,688
The same, after the 6% private pricing discount	\$1,526,267
Annualized, at list	\$19,484,251
Annualized, after the discount	\$18,315,196
Last twelve complete months, February 2025 through January 2026, at list	\$17,456,500
Accounts in scope, of 212 in the organization	48
Validated accounts, and qualified infrastructure accounts	11 and 6
Existing Savings Plan, discount per month (utilization 100%)	\$106,413
The whole organization, per month at list (the other 164 accounts are out of scope)	about \$3.1 million

This week

- **Monday, February 23.** Kickoff with Adaeze Whitfield (Chief Information Officer) and Grace Mbeki (Senior Director, Cloud Platform), and the architecture walkthrough of the 48 accounts. Dr. Lorraine Osei (Senior Director, Quality Assurance, Computerized Systems) set the four ground rules for GxP systems, agreed with Daniel Achterberg.

- **Tuesday, February 24.** The read-only analysis role and billing access went into all 48 accounts through Copperwick's existing StackSets pipeline. In the validated and qualified accounts that deployment is itself a GxP standard change, because it adds a read-only role inside the infrastructure qualification. The supplier assessment (Thursday, February 12) and the access approval (Thursday, February 19) were both done before kickoff; a QA delegate in Computerized Systems Quality signed the notice to QA that day, and Dr. Lorraine Osei approved the change. Copperwick removes the role on Thursday, April 2, by a dated standard change of its own. That day is inside the clinical freeze, and the freeze rules allow it: removing a supplier's access is a security change, which Copperwick's GxP change control permits during a freeze because it changes nothing a validated system does, so the role leaves the frozen clinical accounts the same day as every other account.
- **Wednesday, February 25.** The finance session with Rafael Quintero on the private pricing agreement, the existing Savings Plan, and the commitment decision, and the inventory of every resource type in both Regions.
- **Thursday, February 26.** Ines Halvorsen brought the clinical freeze calendar and Daniel Achterberg the manufacturing campaign dates. Each month of the Cost and Usage Report was tied to the invoice.
- **Friday, February 27.** This report.

The company and its programs

Copperwick Therapeutics, Inc. develops mRNA medicines that make a patient's own cells produce a missing or faulty protein. It was founded in 2012, is publicly traded, and has 2,400 employees, about 600 of them in research and 140 in IT and research computing. Its campus and labs are in Durham, North Carolina; a clinical-supply manufacturing plant is nearby in the Research Triangle, and commercial operations run from the United States and the European Union.

What Copperwick makes and does, and which AWS accounts serve each part.

Line of business	What it is	Where its systems sit
The marketed medicine	One approved mRNA protein-replacement medicine for a rare metabolic disorder, sold in the United States and the European Union since 2024 (never named in these reports)	Commercial systems and the commercial manufacturing network: out of scope
Program Basalt	Phase 3, a second rare metabolic disorder; database lock on March 13, 2026, topline by April 24	Clinical development accounts: in scope, validated
Program Feldspar	Phase 1/2, an mRNA-encoded enzyme for a rare liver disease	Clinical development accounts: in scope
The research platform	mRNA sequence design (machine learning), lipid nanoparticle design (molecular dynamics), structural biology (cryo-EM), and genomics (patient and process sequencing)	Research computing and the scientific data platform: in scope, not validated
Clinical supply	GMP manufacture and QC release of clinical batches	GMP and quality systems: in scope, validated

The calendar that shapes the bill. Copperwick’s bill moves with science, not seasons: weekly sequencing runs, cryo-EM collection campaigns of 10 to 12 days each month, machine-learning training bursts, and clinical milestones. Two milestones fall inside the engagement. Program Basalt’s Phase 3 database lock is Friday, March 13, and the clinical systems freeze from March 2 until topline on Friday, April 24. A manufacturing campaign of three clinical-supply batches runs March 16 to March 27, and the manufacturing systems freeze for it. The private pricing year runs July to June.

Why they called. The in-scope bill grew 20.5% in eleven months, from \$1,318,400 in February 2025 to \$1,589,100 in January 2026, as the machine-learning team took on p4d training instances and cryo-EM processing moved to AWS. The board asked for a cost review before the fiscal 2027 budget and before the private pricing agreement comes up for renewal in mid-2027. Adaeze Whitfield wanted an outside view of research computing. Dr. Lorraine Osei wanted something else: assurance that a cost project would not put a validated system out of its validated state. The engagement started with her rules.

The people

The people on the engagement, each with what they own. Later reports name the same owner for the same thing.

Role in the engagement	Name	Title	Owns
Sponsor	Adaeze Whitfield	Chief Information Officer	The engagement; the weekly check-in; the readouts
Lead	Grace Mbeki	Senior Director, Cloud Platform	The landing zone, network, shared and governance accounts; logging and Config
Finance owner	Rafael Quintero	Vice President, Financial Planning and Analysis	The private pricing agreement; the commitment decision; the AWS invoice
Quality approver	Dr. Lorraine Osei	Senior Director, Quality Assurance, Computerized Systems	The GxP change process: change requests, validation impact assessments, release of validated changes
Workload owner	Priya Okonkwo	Director, Research Computing	Genomics Batch, the Lustre file systems, the development and sandbox accounts, EBS
Workload owner	Mateo Varga	Director, Computational Design	ML training (p4d), SageMaker, the visualization workstations
Workload owner	Hana Lindgren	Associate Director, Structural Biology Computing	Cryo-EM processing and its Lustre file system, the molecular dynamics cluster
Workload owner	Tomasz Reyes	Director, Scientific Data Platform	The data lake, instrument ingest, replication, EFS, the data platform services
Workload owner	Ines Halvorsen	Director, Clinical Data Science Systems	The statistical computing environment (SCE), the clinical data repository (CDR), the biomarker pipelines
Workload owner	Daniel Achterberg	Director, Manufacturing and Quality Systems	LIMS, MES, the chromatography data system (CDS), and the process historian
Consulted	Rosalind Tran	Chief Information Security Officer	CloudTrail and detection

Access and data sources

Roles reached all 48 accounts on Tuesday, February 24, the second day of the engagement. This section records what we read, so that the numbers in the rest of this report can be reproduced and challenged.

What the numbers come from

The sources behind the baseline.

Source	What it gives us	Window and limits
Cost and Usage Report 2.0 (Data Exports)	Hourly cost by account, service, resource ID, and tag	The export, in <code>cw-org-management</code> , has existed since 2023, so the twelve-month baseline was available on day one: February 2025 through January 2026, plus February to date
AWS Cost Explorer	A cross-check of service totals	The same twelve months
AWS Price List API	List prices for every quantity in the bill	The notice at the front of this report names the retrieval dates
Amazon CloudWatch	Utilization for the rightsizing work	Read in week 2
Resource inventory	A <code>describe</code> call for every resource type in 48 accounts and 2 Regions	Taken on Wednesday, February 25; US West (Oregon) holds disaster-recovery replicas only
Copperwick's landing zone	Which repository builds each account	All 48 accounts are built and changed through <code>cw-landing-zone</code>

We tied each month's Cost and Usage Report total to the invoice before using it. Bucket contents, database rows, clinical and manufacturing records, secrets, and log events were never read; the role cannot read them.

The read-only role

Vantalect assumes one IAM role in each account, deployed from the management account as a CloudFormation StackSet through Copperwick's existing pipeline. It reads configuration and metrics. It also reads billing and the Data Exports files. It cannot change a resource, and an explicit Deny blocks the calls that read the contents of buckets, tables, secrets, parameters, and logs.

YAML

```
AWSTemplateFormatVersion: "2010-09-09"
Description: Read-only analysis role for the Vantalect cost engagement. Delete the stack set
when the engagement ends.
Parameters:
  VantalectAccountId:
    Type: String
    AllowedPattern: "^[0-9]{12}$"
  ExternalId:
    Type: String
    NoEcho: true
    MinLength: 16
  CurBucketName:
    Type: String
Resources:
  AnalysisRole:
    Type: AWS::IAM::Role
    Properties:
      RoleName: VantalectAnalysisReadOnly
      MaxSessionDuration: 3600
      AssumeRolePolicyDocument:
        Version: "2012-10-17"
        Statement:
          - Effect: Allow
            Principal:
              AWS: !Sub "arn:${AWS::Partition}:iam::${VantalectAccountId}:root"
            Action: sts:AssumeRole
            Condition:
              StringEquals:
                sts:ExternalId: !Ref ExternalId
  ManagedPolicyArns:
    - !Sub "arn:${AWS::Partition}:iam::aws:policy/job-function/ViewOnlyAccess"
    - !Sub "arn:${AWS::Partition}:iam::aws:policy/AWSBillingReadOnlyAccess"
  Policies:
    - PolicyName: MetricsAndCostExport
      PolicyDocument:
        Version: "2012-10-17"
        Statement:
          - Effect: Allow
            Action: [cloudwatch:GetMetricData, cloudwatch:GetMetricStatistics,
athena:StartQueryExecution, athena:GetQueryExecution, athena:GetQueryResults, glue:GetTable,
glue:GetPartitions]
            Resource: "*"
          - Effect: Allow
            Action: [s3:GetObject, s3:ListBucket]
            Resource:
              - !Sub "arn:${AWS::Partition}:s3:::${CurBucketName}"
              - !Sub "arn:${AWS::Partition}:s3:::${CurBucketName}/*"
          - Effect: Allow # Athena must write its query results somewhere: one prefix,
nothing else
            Action: [s3:PutObject, s3:GetBucketLocation, s3:AbortMultipartUpload]
            Resource:
              - !Sub "arn:${AWS::Partition}:s3:::${CurBucketName}"
              - !Sub "arn:${AWS::Partition}:s3:::${CurBucketName}/athena-results/vantalect/"
            *
    - PolicyName: NoDataPlaneReads
```

```

PolicyDocument:
  Version: "2012-10-17"
  Statement:
    - Effect: Deny
      Action: [s3:GetObject, s3:GetObjectVersion]
      NotResource: !Sub "arn:${AWS::Partition}:s3::${CurBucketName}/*"
    - Effect: Deny
      Action: [dynamodb:GetItem, dynamodb:Query, dynamodb:Scan,
secretsmanager:GetSecretValue, ssm:GetParameter*, kms:Decrypt, logs:GetLogEvents,
logs:FilterLogEvents, sqs:ReceiveMessage]
      Resource: "*"

```

The role writes one thing: Athena's query results, to the athena-results/vantalect/ prefix of the Cost and Usage Report export bucket, because Athena cannot return a result without writing it to S3. Everything else it can only read. The GxP raw-data buckets in sdp-lake-prod carry Object Lock and versioning, and the role can neither read their contents nor write to them.

Service-managed StackSets skip the management account, so cw-org-management gets the same template as an ordinary stack. That account also holds the export bucket.

BASH

```

aws cloudformation create-stack-set --stack-set-name vantalect-analysis-readonly \
  --template-body file://vantalect-analysis-role.yaml \
  --parameters ParameterKey=VantalectAccountId,ParameterValue=<vantalect-account-id> \
    ParameterKey=ExternalId,ParameterValue=<external-id> \
    ParameterKey=CurBucketName,ParameterValue=<cur-bucket> \
  --capabilities CAPABILITY_NAMED_IAM --permission-model SERVICE_MANAGED \
  --auto-deployment Enabled=true,RetainStacksOnAccountRemoval=false
aws cloudformation create-stack-instances --stack-set-name vantalect-analysis-readonly \
  --deployment-targets OrganizationalUnitIds=<root-ou-id> --regions us-east-1

```

The Cost and Usage Report is the one data-plane read the engagement needs, so the role gets exactly that and nothing more: Athena queries, the table definitions, and the export files. In member accounts the bucket does not exist, so those statements do nothing. The Deny statements exempt only the export bucket, so the role still cannot read any other object, secret, parameter, or log event. To remove access at the end of the engagement, delete the stack set.

In the 11 validated accounts and 6 qualified infrastructure accounts, adding the role is a GxP standard change: like-for-like, reversible, with no effect on a GxP function. It needed a ticket, an executed installation checklist, and notice to QA, and it needed no new validation ([The GxP ground rules, the freezes, and change control](#)). The notice to QA was signed by a QA delegate in Computerized Systems Quality, not by Dr. Lorraine Osei, who approved the change; the supplier assessment (Thursday, February 12) and the access approval (Thursday, February 19) came before kickoff on Monday, February 23. Copperwick removes the role on Thursday, April 2, by a dated standard change, so the access ends on a date and does not wait on a request. That day is inside the clinical freeze, and the freeze rules allow it: removing a supplier's access is a security change,

which Copperwick's GxP change control permits during a freeze because it changes nothing a validated system does, so the role leaves the frozen clinical accounts the same day as every other account.

Cost and Usage Report 2.0

The export already existed, so no one waited on data. Copperwick's Savings Plan and private pricing discount appear in the export as their own line types, which is why the query below sums the usage and plan lines and leaves out the line types that carry the discount, to reproduce the list-price basis of this report. It produces the monthly series by service for the 48 in-scope accounts, whose IDs sit in a one-column table.

```
SQL
SELECT date_format(bill_billing_period_start_date, '%Y-%m') AS month,
       line_item_product_code AS service,
       round(sum(line_item_unblended_cost), 2) AS cost
FROM cur2.copperwick_cur
WHERE line_item_usage_account_id IN (SELECT account_id FROM copperwick_cur.engagement_accounts)
     AND line_item_line_item_type NOT IN ('EdpDiscount', 'PrivateRateDiscount', 'Tax', 'Credit',
     'Refund')
     AND bill_billing_period_start_date >= TIMESTAMP '2025-02-01 00:00:00'
GROUP BY 1, 2
ORDER BY 1, 3 DESC;
```

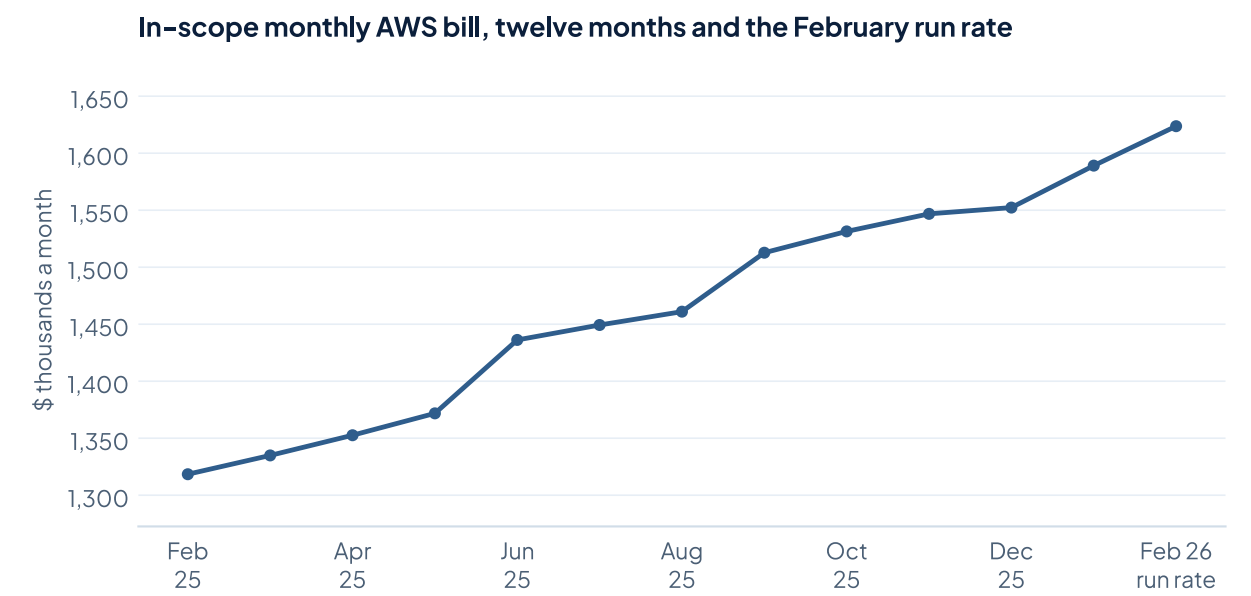
Later reports measure savings on a different column, `pricing_public_on_demand_cost`, so that neither the existing Savings Plan nor the private pricing discount is counted twice. Week 1 needs only the monthly series above.

What the data cannot tell us

- **Whether a resource is part of a validated system.** The export carries accounts, services, and tags, not GxP status. The status of each account comes from the quality team's register of validated and qualified accounts ([All 48 accounts](#)).
- **A campaign peak.** One month of run rate cannot show a cryo-EM campaign of 10 to 12 days or a training burst. Week 2 reads utilization over longer windows before it sizes anything.
- **The other 164 accounts.** Commercial operations, the European estate, corporate IT, the commercial manufacturing network, and patient services run at about \$1,476,000 a month at list and are out of scope.
- **Enterprise Support, which is billed on the whole organization.** It is not in the in-scope total ([Enterprise Support](#)).
- **The contents of any record.** The role cannot read object contents, database rows, or log events, so nothing in this engagement touches a GxP record.

Twelve months of spend

The baseline is the twelve complete months before kickoff, for the 48 in-scope accounts, on the same basis as the bill above. Spend rose from \$1,318,400 in February 2025 to \$1,589,100 in January 2026, a rise of \$270,700, or 20.5%, and the February run rate is \$1,623,688, \$34,588 (2.2%) above January. It rose in every month. The two largest steps, \$64,400 in June 2025 (five p4d.24xlarge for sequence-design model training) and \$51,700 in September 2025 (cryo-EM processing moves to AWS: ten g5.12xlarge and a 60 TiB Lustre file system), together are \$116,100 of the \$270,700.



The monthly bill for the in-scope accounts, in thousands of dollars, with the February 2026 run rate at the right.

The bill by month at list, after the existing Savings Plan, with what changed. The twelve-month total is the sum of the twelve months above it.

Month	What changed	Bill	Added over prior month
February 2025		\$1,318,400	n/a
March 2025		\$1,334,900	\$16,500
April 2025		\$1,352,600	\$17,700
May 2025		\$1,371,800	\$19,200

Month	What changed	Bill	Added over prior month
June 2025	Five p4d.24xlarge for sequence-design model training	\$1,436,200	\$64,400
July 2025		\$1,449,300	\$13,100
August 2025		\$1,461,000	\$11,700
September 2025	Cryo-EM processing moves to AWS: ten g5.12xlarge and a 60 TiB Lustre file system	\$1,512,700	\$51,700
October 2025	Basalt Phase 3 last patient visit; SCE and CDR load rises	\$1,531,400	\$18,700
November 2025		\$1,546,800	\$15,400
December 2025		\$1,552,300	\$5,500
January 2026	A third weekly sequencing run	\$1,589,100	\$36,800
Twelve months		\$17,456,500	
February 2026 run rate	The estate on February 23, 2026, priced for a 730-hour month	\$1,623,688	\$34,588

Read this series as experiments, not seasons. A research bill rises when a new kind of work arrives: a training fleet, a microscope, another sequencing run. The useful question about any step is what the work costs per unit of science, so the later reports normalize where the science allows it: genomics spend per 30× whole-genome equivalent processed, cryo-EM per collection campaign, and machine-learning spend per training run. A growth rate computed from this table would say less than any of those.

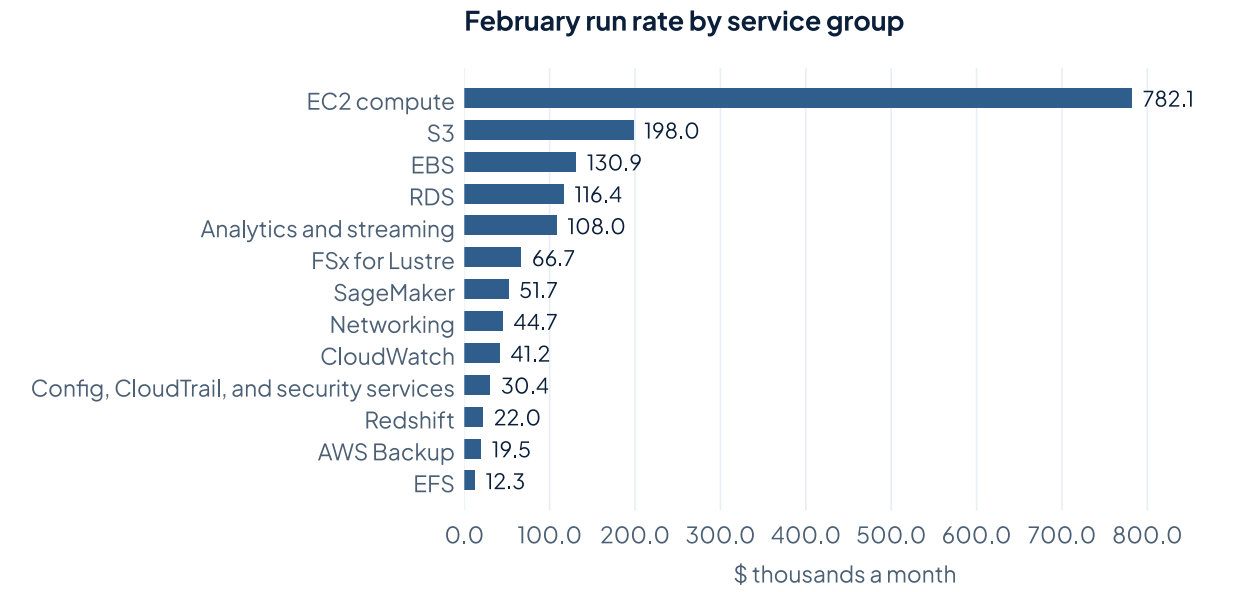
Spend by service group

EC2 compute is 48.2% of the bill, S3 is 12.2%, and EBS is 8.1%. The research platform's storage (S3, EBS, FSx for Lustre, and EFS) comes to \$407,784 a month, because sequencers and microscopes produce data faster than anyone decides what to keep.

The bill by service group, at list after the existing Savings Plan. \$19,484,251 a year.

Service group	What is in it	Monthly	Share
EC2 compute	Genomics Batch On-Demand, the molecular dynamics cluster, 5 p4d.24xlarge and 10 g5.12xlarge always on, 60 workstations, the EKS research analytics platform, validated application servers, development, shared services, and sandboxes; net of the existing plan's \$106,413 discount	\$782,084	48.2%
S3	6.5 PB in Standard, 0.9 PB in Standard-IA, 1.4 PB in Deep Archive, requests, and 0.8 PB of replicas in us-west-2 Standard	\$197,966	12.2%
EBS	530 TB of attached gp2, 260 TB of attached gp3, 90 TB of unattached gp2, and 900 TB of snapshots billed	\$130,867	8.1%
RDS	LIMS (Oracle, BYOL) and MES (SQL Server) production and val databases, Multi-AZ; 6 Multi-AZ development databases; research and platform databases; storage and backups	\$116,399	7.2%
Analytics and streaming	Glue, Athena, DynamoDB, OpenSearch, MSK for instrument event streams, ECR, Lambda, ECS, Step Functions, and Route 53	\$108,000	6.6%
FSx for Lustre	Genomics (64 TiB at 1,000 MB/s/TiB), cryo-EM (60 TiB at 500), molecular dynamics (30 TiB at 250)	\$66,663	4.1%
SageMaker	4 ml.g5.12xlarge notebooks always on, other notebooks, training jobs, and endpoints	\$51,703	3.2%
Networking	36 NAT gateways and 300 TB processed, Transit Gateway (58 attachments), two 10 Gbps Direct Connect ports to the labs, cross-AZ transfer, collaborator egress, load balancers, public IPv4 addresses, and interface endpoints	\$44,682	2.7%
CloudWatch	48 TB of logs ingested a month (34 TB of it Batch job logs), 300 TB stored with no expiry, and metrics	\$41,192	2.5%
Config, CloudTrail, and security services	Config continuous recording (1.6 million items a month in the three high-churn accounts), 4.0 billion S3 data events, GuardDuty, Security Hub, Inspector, KMS, and Secrets Manager	\$30,400	1.9%
Redshift	The clinical data repository: 8 ra3.4xlarge nodes and 120 TB of managed storage	\$21,988	1.3%
AWS Backup	380 TB warm: validated systems and research databases	\$19,456	1.2%
EFS	40 TB of home and project directories, all Standard	\$12,288	0.8%

Service group	What is in it	Monthly	Share
Total		\$1,623,688	100.0%



The February run rate by service group, in thousands of dollars a month.

The lines that drive the bill

Every line below is a quantity times a price from the AWS Price List. A line with an hourly price is the quantity times the price times 730 hours; a line with a monthly storage or processing price is the quantity in gigabytes times the price, at 1,024 gigabytes to the terabyte. The monthly figure is computed from the two and rounded to the dollar.

The lines that carry the most spend and the quantity and price behind each. The S3 lines use the published tiers: the first 50 TB, the next 450 TB, and everything over 500 TB.

Line	Quantity	List price	Per month
S3 Standard, 6.5 PB	6.5 PB	\$0.023, \$0.022, and \$0.021 a GB-month by tier	\$143,694
Genomics Batch, research pipelines, On-Demand	102 c6i.8xlarge on average	\$1.36 an hour	\$101,266
ML training	5 p4d.24xlarge, always on	\$21.957642 an hour	\$80,145
Visualization workstations	60 g5.2xlarge, always on	\$1.212 an hour	\$53,086

Line	Quantity	List price	Per month
Snapshots, billed size (900 TB)	900 TB billed	\$0.05 a GB-month	\$46,080
Cryo-EM processing	10 g5.12xlarge, always on	\$5.672 an hour	\$41,406
Molecular dynamics cluster	10 c6i.32xlarge on average	\$5.44 an hour	\$39,712
Genomics, 64 TiB persistent-2 at 1,000 MB/s/TiB	64 TiB persistent-2 at 1,000 MB/s/TiB	\$0.60 a GB-month	\$39,322
SCE grid (validated)	8 r6i.16xlarge, RHEL	\$4.7232 an hour	\$27,583
Log ingestion: Batch job logs 34 TB, other 14 TB	48 TB ingested a month, 34 TB of it Batch job logs	\$0.50 a GB	\$24,576
Notebooks: 4 ml.g5.12xlarge, always on	4 ml.g5.12xlarge, always on	\$7.09 an hour	\$20,703
Data platform services	36 m6i.4xlarge	\$0.768 an hour	\$20,183
Replicas in us-west-2, Standard, 0.8 PB	0.8 PB	the same tiers in us-west-2	\$18,179
Clinical biomarker pipelines (GCP-validated), their own AWS Batch environment, On-Demand	18 c6i.8xlarge on average, in clin-biomarker-prod	\$1.36 an hour	\$17,870
MES, SQL Server SE, db.r5.4xlarge Multi-AZ: production and val	2 db.r5.4xlarge SQL Server SE, Multi-AZ	\$12.16 an hour each	\$17,754
LIMS, Oracle EE (BYOL), db.r5.8xlarge Multi-AZ: production and val	2 db.r5.8xlarge Oracle BYOL, Multi-AZ	\$7.456 an hour each	\$10,886

The remaining lines in [The bill by service group, at list after the existing Savings Plan. \\$19,484,251 a year](#) are priced the same way from the Cost and Usage Report's own lines, or, for a long tail of small services and for the EKS platform, from the accounts' run rate.

Who runs the bill

The same bill, grouped by who runs it. Platform and shared services is small because the existing Savings Plan's discount of \$106,413 a month is booked there, against the compute it covers.

The bill by cost family. Every owner here is named in [The people on the engagement, each with what they own](#). Later reports name the same owner for the same thing.

Cost family	What is in it	Owners	Monthly	Share
Research computing	Genomics Batch, the molecular dynamics cluster, ML training, cryo-EM processing, workstations, the EKS analytics platform, the Lustre file systems, SageMaker, EBS, and the research databases	Priya Okonkwo, Mateo Varga, Hana Lindgren	\$978,836	60.3%
Scientific data platform	The data lake in S3 and its replicas, data platform services, analytics and streaming, and EFS	Tomasz Reyes	\$338,437	20.8%
Validated systems	The LIMS, MES, CDS, and SCE application servers and their val environments, the LIMS and MES databases, and the clinical data repository on Redshift	Ines Halvorsen, Daniel Achterberg	\$140,591	8.7%
Clinical applications, not GxP	Clinical operations and translational applications that are not GxP	Ines Halvorsen	\$84,000	5.2%
Lab sandboxes	The ten lab sandbox accounts	Priya Okonkwo	\$34,000	2.1%
Development accounts	Development accounts for research, clinical, and GMP systems, running around the clock	Priya Okonkwo, Ines Halvorsen, Daniel Achterberg	\$26,760	1.6%
Platform and shared services	Networking, logging, security services, backup, and shared services, net of the existing Savings Plan's discount	Grace Mbeki	\$21,064	1.3%
Total			\$1,623,688	100.0%

The 48 accounts

Copperwick has one AWS organization with one bill and 212 accounts. The engagement covers 48 of them, in six families; the other 164 are out of scope. Everything in scope runs in US East (N. Virginia), with disaster-recovery replicas in US West (Oregon). The engagement's limit is 50 accounts, and 48 is inside it.

The 48 accounts by family, with each family's GxP status.

Account family	AccountsExamples	Owners	Validated	Qualified	NotGxP status GxP
Platform and shared	7cw-org-management, cw-log-archive, cw-security-tooling, and others	Grace Mbeki	0	5	2Five are qualified infrastructure (network, shared services, log archive, backup, security tooling)
Research computing	9rc-genomics-prod, rc-genomics-dev, rc-cryoem-prod, and others	Hana Lindgren, Mateo Varga, Priya Okonkwo	0	0	9Not GxP
Scientific data platform	6sdp-lake-prod, sdp-lake-dev, sdp-ingest-prod, and others	Tomasz Reyes	0	1	5One qualified: in sdp-lake-prod, the GxP raw-data buckets (under Object Lock) are qualified infrastructure; the research buckets are not GxP
Lab sandboxes	10lab-sbx-01, lab-sbx-02, lab-sbx-03, and others	Priya Okonkwo	0	0	10Not GxP
Clinical development	7clin-sce-prod, clin-sce-val, clin-sce-dev, and others	Ines Halvorsen	4	0	3Four validated (SCE production and val, CDR production, biomarker pipelines)
GMP and quality systems	9gmp-lims-prod, gmp-lims-val, gmp-lims-dev, and others	Daniel Achterberg	7	0	2Seven validated (all but the two dev accounts)
Total	48		11	6	3111 validated, 6 qualified infrastructure

The research VPCs run Batch jobs against data in S3, and that traffic is one of the things the inventory looks at in week 2. The research VPCs run their own NAT gateways (36 in all); only the validated VPCs use the shared NAT gateways in `cw-network`. Disaster-recovery replicas live in `sdp-replica-dr`, the only in-scope account in US West (Oregon).

All 48 accounts

Every in-scope account, with its owner and GxP status. 11 are validated, 6 are qualified infrastructure, and 31 are not GxP.

Account	ID (last four)	Environment	Owner	GxP status	Region	What it holds
cw-org-management	...1012	Management	Grace Mbeki	Not GxP	us-east-1	Organization, consolidated billing, and the CUR export
cw-log-archive	...1037	Security	Grace Mbeki	Qualified infrastructure	us-east-1	CloudTrail, Config, and flow-log archive
cw-security-tooling	...1045	Security	Grace Mbeki	Qualified infrastructure	us-east-1	GuardDuty, Security Hub, and Inspector delegated administrator
cw-network	...1063	Shared services	Grace Mbeki	Qualified infrastructure	us-east-1	Transit Gateway, Direct Connect to the labs, and the validated VPCs' NAT gateways
cw-shared-services	...1078	Shared services	Grace Mbeki	Qualified infrastructure	us-east-1	Directory, bastions, and CI runners
cw-backup	...1084	Shared services	Grace Mbeki	Qualified infrastructure	us-east-1	AWS Backup vaults for validated systems and research databases
cw-cicd	...1096	Shared services	Grace Mbeki	Not GxP	us-east-1	Build and deployment pipelines
rc-genomics-prod	...2104	Production	Priya Okonkwo	Not GxP	us-east-1	Genomics AWS Batch and its Lustre file system
rc-genomics-dev	...2117	Non-production	Priya Okonkwo	Not GxP	us-east-1	Genomics pipeline development
rc-cryoem-prod	...2125	Production	Hana Lindgren	Not GxP	us-east-1	Cryo-EM processing workers and Lustre
rc-md-prod	...2139	Production	Hana Lindgren	Not GxP	us-east-1	The molecular dynamics cluster
rc-ml-prod	...2146	Production	Mateo Varga	Not GxP	us-east-1	ML training (p4d.24xlarge) and SageMaker
rc-ml-dev	...2152	Non-production	Mateo Varga	Not GxP	us-east-1	ML development notebooks
rc-workstations	...2168	Production	Mateo Varga	Not GxP	us-east-1	Scientist visualization workstations

Account	ID (last four)	Environment	Owner	GxP status	Region	What it holds
rc-eks-prod	...2173	Production	Priya Okonkwo	Not GxP	us-east-1	The research analytics platform on EKS
rc-eks-dev	...2181	Non-production	Priya Okonkwo	Not GxP	us-east-1	Research analytics development
sdp-lake-prod	...3105	Production	Tomasz Reyes	Qualified infrastructure	us-east-1	The data lake; its GxP raw-data buckets are qualified infrastructure
sdp-lake-dev	...3112	Non-production	Tomasz Reyes	Not GxP	us-east-1	Data lake development
sdp-ingest-prod	...3128	Production	Tomasz Reyes	Not GxP	us-east-1	Instrument ingest from the labs
sdp-streams-prod	...3134	Production	Tomasz Reyes	Not GxP	us-east-1	MSK instrument event streams
sdp-catalog-prod	...3147	Production	Tomasz Reyes	Not GxP	us-east-1	Glue catalog, Athena, and OpenSearch
sdp-replica-dr	...3159	Production	Tomasz Reyes	Not GxP	us-west-2	Disaster-recovery replicas
lab-sbx-01	...4001	Sandbox	Priya Okonkwo	Not GxP	us-east-1	Lab sandbox
lab-sbx-02	...4002	Sandbox	Priya Okonkwo	Not GxP	us-east-1	Lab sandbox
lab-sbx-03	...4003	Sandbox	Priya Okonkwo	Not GxP	us-east-1	Lab sandbox
lab-sbx-04	...4004	Sandbox	Priya Okonkwo	Not GxP	us-east-1	Lab sandbox
lab-sbx-05	...4005	Sandbox	Priya Okonkwo	Not GxP	us-east-1	Lab sandbox
lab-sbx-06	...4006	Sandbox	Priya Okonkwo	Not GxP	us-east-1	Lab sandbox
lab-sbx-07	...4007	Sandbox	Priya Okonkwo	Not GxP	us-east-1	Lab sandbox
lab-sbx-08	...4008	Sandbox	Priya Okonkwo	Not GxP	us-east-1	Lab sandbox
lab-sbx-09	...4009	Sandbox	Priya Okonkwo	Not GxP	us-east-1	Lab sandbox
lab-sbx-10	...4010	Sandbox	Priya Okonkwo	Not GxP	us-east-1	Lab sandbox
clin-sce-prod	...5103	Production	Ines Halvorsen	Validated	us-east-1	Statistical computing environment (SCE) grid

Account	ID (last four)	Environment	Owner	GxP status	Region	What it holds
clin-sce-val	...5116	Non-production	Ines Halvorsen	Validated	us-east-1	SCE validation environment
clin-sce-dev	...5124	Non-production	Ines Halvorsen	Not GxP	us-east-1	SCE development
clin-cdr-prod	...5137	Production	Ines Halvorsen	Validated	us-east-1	Clinical data repository (Redshift)
clin-cdr-dev	...5141	Non-production	Ines Halvorsen	Not GxP	us-east-1	CDR development
clin-biomarker-prod	...5158	Production	Ines Halvorsen	Validated	us-east-1	GCP-validated biomarker pipelines
clin-ops-prod	...5162	Production	Ines Halvorsen	Not GxP	us-east-1	Clinical operations and translational apps
gmp-lims-prod	...6107	Production	Daniel Achterberg	Validated	us-east-1	LIMS production
gmp-lims-val	...6113	Non-production	Daniel Achterberg	Validated	us-east-1	LIMS validation environment
gmp-lims-dev	...6129	Non-production	Daniel Achterberg	Not GxP	us-east-1	LIMS development
gmp-mes-prod	...6134	Production	Daniel Achterberg	Validated	us-east-1	MES production
gmp-mes-val	...6148	Non-production	Daniel Achterberg	Validated	us-east-1	MES validation environment
gmp-mes-dev	...6151	Non-production	Daniel Achterberg	Not GxP	us-east-1	MES development
gmp-cds-prod	...6167	Production	Daniel Achterberg	Validated	us-east-1	Chromatography data system production
gmp-cds-val	...6172	Non-production	Daniel Achterberg	Validated	us-east-1	CDS validation environment

Account	ID (last four)	Environment	Owner	GxP status	Region	What it holds
gmp-historian-prod	...6185	Production	Daniel Achterberg	Validated	us-east-1	Process historian

The GxP ground rules, the freezes, and change control

This is the section a finance reader should read first. Copperwick validates its GxP computerized systems under 21 CFR Part 11 and GAMP 5, using a risk-based computer software assurance approach for testing. The cloud platform underneath is qualified infrastructure: the landing zone, network, and shared services are built from code under an infrastructure qualification, so a change inside that qualification is controlled but does not revalidate the applications above it.

At kickoff, Dr. Lorraine Osei set four rules, and every finding in the reports that follow carries a class that comes from them.

The four GxP ground rules.

Rule	What it covers	What a change needs
1. Non-GxP accounts	The 31 accounts that are not validated or qualified, and the parts of a qualified account outside its qualification: sdp-lake-prod is qualified for the GxP raw-data buckets and the account controls that protect them only, so a change to its research buckets follows this rule	The platform team's normal change process. Most of the savings are expected here
2. GxP standard change	A pre-approved change type in the qualified infrastructure catalog, used for validated systems and for a change that runs from or lands in a qualified infrastructure account (the network, shared services, log archive, backup, and security tooling accounts, and the controls in sdp-lake-prod that protect the GxP raw-data buckets): like-for-like, reversible, with no effect on a GxP function. Example: gp2 to gp3 on a validated server, as an online Elastic Volumes change with the gp3 volume provisioned to match or beat the gp2 volume's IOPS and throughput	A ticket, an executed installation checklist, and notice to QA. No new validation
3. GxP change request	Anything else in a validated system: a database resize, a storage-class change on GxP records, a new network path	The GxP change advisory board, which meets on Tuesdays (March 3 through March 31 during the engagement). A validation impact assessment, risk-based testing (unscripted where the risk is low, scripted operational qualification where a GxP function could be affected), QA approval, and a release window

Rule	What it covers	What a change needs
4. A freeze	Every change in its scope, with no exception for cost; the one exception is a security change, such as removing a supplier's access	Nothing. A frozen system waits

The freeze calendar and the change advisory board

The two freezes inside the engagement. Program Basalt's database lock is Friday, March 13.

Freeze	Scope	From	To	Length
Clinical freeze	From March 2, ahead of Program Basalt's database lock (March 13), to topline (April 24): SCE production and val, CDR production, and the biomarker pipelines	Monday, March 2	Friday, April 24	54 days
Manufacturing campaign freeze	The GMP campaign of three clinical-supply batches for Basalt's open-label extension: LIMS, MES, and CDS production and the process historian	Monday, March 16	Friday, March 27	12 days

A freeze is defined by system, not by family. The clinical freeze covers `clin-sce-prod`, `clin-sce-val`, `clin-cdr-prod`, and `clin-biomarker-prod`. The manufacturing campaign freeze covers `gmp-lims-prod`, `gmp-mes-prod`, `gmp-cds-prod`, and `gmp-historian-prod`. Nothing else is frozen: the 8 development accounts (the `clin-` and `gmp-` ones included), the GMP val environments (`gmp-cds-val`, `gmp-lims-val`, and `gmp-mes-val`, which sit outside the manufacturing freeze), and clinical operations (`clin-ops-prod`) are in no freeze, so a change to them follows its own class and waits only for the calendar that class carries. Every report that follows applies the freezes in exactly this way.

The GxP change advisory board meets on 5 Tuesdays inside the engagement: March 3, March 10, March 17, March 24, and March 31. A change request that misses a Tuesday waits for the next one, and a change that needs a release window waits for that too. The reports that follow state each wait as a date, and no report presents a deferred change as a saving.

Data retention

Records keep their retention. No finding deletes, shortens, or weakens a GxP record, an audit trail, or a backup of a validated system.

- **GxP records** keep their SOP retention. The GxP raw-data buckets keep Object Lock and versioning. Their CloudTrail data events and their log groups keep SOP retention as well.
- **Snapshots in validated accounts** are excluded from the waste work.

- **Research raw data** has a retention obligation too: ten years for raw data that backs invention records. A change to how that data is stored moves it to a colder storage class and never out of retention.

What is already done well

A report that finds waste everywhere is not believable, so week 1 records what needs no change.

- **The EKS research analytics platform** (\$312,000 a month, 19.2% of the bill) already runs on Karpenter with Spot and Graviton. It is not a finding.
- **The existing Savings Plan is fully used.** It saves \$106,413 a month at 100% utilization (\$1,276,957 a year), and the bill above is already net of it ([The existing Savings Plan](#)).
- **The Direct Connect ports are sized to the instrument uploads they carry.** Two 10 Gbps ports cost \$3,899 a month with the 30 TB of data out, and no report proposes changing them.

The existing Savings Plan

Copperwick holds one commitment today: a three-year No Upfront Compute Savings Plan at **\$150 an hour**, bought for August 1, 2024 and running to July 31, 2027. At the three-year rate for the general-purpose families (49.3% off m6i) it covers **\$295.77 an hour** of On-Demand usage and saves **\$106,413 a month**, with 100% utilization every month. A Savings Plan applies first to the usage it saves the most on, so the plan sits on the non-GPU floor of the estate; the GPU fleet is all On-Demand. The plan's fee is \$109,500 a month at 730 hours, and the \$215,913 of On-Demand usage it covers is billed at the plan rate instead.

Because the plan is fully used, there is no unused commitment to recover, and any new commitment would sit on top of it. The commitment decision belongs to Rafael Quintero and comes in week 4.

The private pricing agreement

Copperwick has a private pricing agreement with AWS. It is a contract term, not a list price, and it sits under every number in this report.

The private pricing agreement and where Copperwick stands against it. The in-scope accounts are 52.4% of the organization’s spend at list.

Term	Value
Agreement term	July 1, 2024 to June 30, 2027 (3 years)
Annual commitment, in spend net of the discount	\$27,000,000 (\$2,250,000 a month)
Discount	A flat 6% on eligible usage, Savings Plan fees included
In-scope bill, per month at list	\$1,623,688
The same, after the discount	\$1,526,267
The discount on the in-scope accounts, per month	\$97,421
The whole organization, per year at list	\$37,196,251
The whole organization, per year after the discount	\$34,964,476
Above the commitment today, per year	\$7,964,476 (22.8% of net spend)

Two consequences follow. First, a saving on these accounts is worth 6% less in cash than the same saving at list, so every saving and the guarantee’s gate from the readout on are stated net of the discount. Second, the organization’s spend today is above the commitment, so a saving does not create a shortfall against it. The later reports test that against each stage of the roadmap, and they use the savings to inform the 2027 renewal.

Enterprise Support

AWS Enterprise Support is billed to the whole organization as a percentage of all usage, on a tiered schedule, and it is not part of the in-scope figure. The tiers below are from the AWS Price List bulk API, applied to the organization’s usage at list, about \$3,099,688 a month.

Enterprise Support, estimated on the organization’s usage at list. The rate in the total row is the fee as a share of usage.

Monthly usage tier	Usage in the tier	Rate	Fee
First \$150,000	\$150,000	10%	\$15,000
\$150,000 to \$500,000	\$350,000	7%	\$24,500
\$500,000 to \$1,000,000	\$500,000	5%	\$25,000
Over \$1,000,000	\$2,099,688	3%	\$62,991
Total	\$3,099,688	4.1%	\$127,491

Support is neither in the \$1,623,688 nor a finding in this engagement. At the top tier the rate is 3%, so each dollar of usage that falls also lowers the Support fee by about three cents; no report counts that.

What week 2 will do

Week 2 runs from Monday, March 2, through the sponsor readout on Friday, March 6. The clinical freeze begins on the first day of the week. The savings review with every owner and QA is Thursday, March 5, and the Analysis report is due the same day. The Analysis produces six more deliverables:

The deliverables of the Analysis, in order.

Deliverable	What it contains
2. The waste register	Every idle and orphaned resource with its ID, owner, monthly cost, GxP class, and the runbook to remove it
3. The rightsizing plan	Compute, databases, and file systems sized to measured use, with Graviton and Spot where they fit
4. The commitment plan	A Savings Plan sized to the floor that will survive the changes, tested at smaller sizes and around the private pricing agreement
5. The architecture review	Data transfer, NAT, storage tiers, logging, and the data lake, with the code for each change
6. The savings roadmap	Every opportunity ranked by annual savings, effort, and risk, each with its GxP change path
7. The sponsor readout	The identified savings, what change control and the freezes allow, the decisions for the CIO and finance, and the risks, in one short document

The access, the inventory, the finance session, and both calendars arrived this week, so week 2 starts with everything it needs. Grace Mbeki remains the day-to-day contact, and Adaeze Whitfield receives the readout.

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