



Regional Aerial Photo Consortium

6-Year Strategic Plan

Vertical orthophotos and lidar

October 2024

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INTRODUCTION

The Regional Aerial Photo Consortium (the Consortium) is an informally organized group of local governments and special districts in the Portland metropolitan area. The Consortium, administered by Metro, has pooled resources to share the costs and leverage public dollars for the purpose of acquiring aerial photography and fixed-wing aircraft lidar collection since the mid-1990s. This Strategic Plan represents an overview and goals for the Consortium that will keep the imagery program on track and responsive to current and future needs through 2030.

CONSORTIUM PURPOSE

The Consortium's purpose is to coordinate the acquisition of high-quality imagery products in a cost-effective manner, by fostering collaboration, pooling resources, and leveraging regional staff expertise. By sharing project costs, Consortium members gain access to imagery products that would otherwise be financially unattainable for any member acting alone. Such collaboration significantly increases the return on investment for these high-quality, essential products, providing a significant benefit to the public.

OBJECTIVES OF THIS DOCUMENT

- Provide background and context on the Consortium
- Outline Consortium governance processes
- Provide a six-year acquisition plan for aerial photos and related imagery
- Describe how acquisition geographies will be determined
- Describe cost sharing procedures and introduce the new “predictable cost” model
- Provide minimum specifications for core Consortium products
- Identify potential collaboration opportunities
- Establish rules and procedures for member participation.

HISTORY/BACKGROUND

The Regional Aerial Photo Consortium (the Consortium) as we know it today has operated since the mid-1990s. The first digital product was produced by scanning traditional aerial photos from 1994. In 1996 the second digital aerial photo product was created as part of the initial imagery collection. The second digital product, which was easier to view and analyze, kicked off the modern era of annual digital imagery. Since then, Metro, on behalf of the Consortium, has contracted for an annual aerial photo flight and data collection. The cost-sharing arrangement among regional partners currently saves the region an estimated \$700,000 to \$800,000 per year by avoiding redundant data acquisition and project costs.

Digital photos collected by fixed wing aircraft and processed to remove distortion are very important to Consortium member organizations and the public. These **orthophotographs** or **orthophotos** are integral to multiple business processes and programs, enhancing operational efficiency. Consortium members consistently report that orthophotos play a significant role in their activities and operations, making data quality a key consideration. Remotely sensed data are considered perishable, due to the constantly changing physical landscape, so consistent capture schedules and timely delivery are additional priorities alongside data quality.

To increase data collection frequency and reduce costs, Metro's Data Resource Center (DRC), in partnership with regional local governments, developed the **Regional Aerial Photo Consortium**. The Consortium allows government entities and nonprofit organizations to:

- **Purchase larger coverage areas** to secure better pricing per square mile.
- **Share the costs** of areas of common interest among multiple partners.
- **Avoid duplication** - the final costs are reduced by as much as 80% compared to contracts undertaken individually.
- **Improve administrative efficiency** by centralizing administration, procurement, and contracting through Metro.

Consortium member needs for remote sensing products evolve over time, as does the technology used to capture and process them. Staying ahead of emerging trends and addressing stakeholder needs is essential. The DRC has tracked these changes and adjusted the program accordingly. This document will serve as a guide for the next phases of the Consortium's evolution.

In recent years, lidar (light detection and ranging) has become more accessible and affordable, and the Consortium collected lidar data as part of the 2014 and 2019 projects. This is now considered a regular product to be acquired through the Consortium.

GOVERNANCE

Metro serves as the coordinator and administrator of the Consortium, responsible for making decisions to carry out its business. While Metro will strive to achieve consensus among Consortium members for all major decisions and seek their input on relevant matters, it reserves the right to make the final decision if consensus or a significant majority cannot be reached.

Strategic Planning

The Consortium Strategic Plan will be updated at least every 6 years. After the first 3 years of the planning period, Metro will check in with the Consortium to see if an earlier update to the plan is needed based on changing technologies, requirements, etc.

TIMELINE AND ACQUISITION SCHEDULE

The following table outlines regional flights proposed through the end of 2030. The minimum and extended area of interest (AOI) are defined in the Acquisition Geography section below.

YEAR	Orthophoto Leaf-on	Orthophoto Leaf-off	Lidar
2025	YES		
2026	YES*		
2027	YES		
2028	YES*	YES	
2029*	YES		YES
2030	YES		

* Extended area and biennial participation

The current summer orthophoto (leaf-on) contract expires in 2025. A formal solicitation for the Consortium’s orthophoto vendor will be conducted in fiscal year 2024-25, with the Request for Proposals (RFP) going out in Winter 2024. The summer 2025 acquisition will be the first project under the new contract that results from this process.

As in previous years, the annual acquisitions will proceed using the following general timeline.

YEAR OF ACQUISITION	MEMBER
February	Member meeting: flight proposal
March-April	Deadline for additional AOI and member feedback
May-June	Vendor contract finalized and flight plan confirmed, acquisition window opens
July	Pilot project due 6 weeks from flight completion date
August-September	Preliminary web service available
October	Full resolution TIFF images due 12 weeks from flight completion date
November	All images and corrections due 4 months from completion date
December	Hard drive delivery deadline

Orthophoto Leaf-Off

The most recent regional leaf-off flight occurred in late March 2024. The 2024 Consortium Member survey included a question about the preferred frequency of leaf off collections, and responses were mixed. Given the uncertainty of adequate participation in a more frequent leaf off collection, Metro is opting to continue with a 5-year cadence at this time but is open to revisiting this in coming years. If other Consortium members require a leaf-off flight in a non-Consortium year, they may utilize Metro’s contract and manage the project themselves as described in the collaboration section below.

Leaf-off flights have historically been conducted in March to April timeframes. The acquisition would proceed using the following general timeline, assuming a March acquisition window.

MONTH	MEMBER
January - February	Vendor contract finalized and flight plan confirmed
March - April	Acquisition window
May	Pilot project due 6 weeks from flight completion date, preliminary web service
June	Full resolution TIFF images due 12 weeks from flight completion date
July	All images and corrections due 4 months from completion date
August	Hard drive delivery deadline

Lidar

The Consortium will continue a 5-year cycle for collecting lidar data. The project planning process will begin in Summer 2027 for a 2029 project. The most cost effective and timely deliveries of lidar projects in the Consortium’s history have resulted from collaborations with the United States Geological Survey (USGS). After many discussions with the USGS preparing for the 2024 acquisition, Metro learned that the best method to partner with them is a Data Collaboration with the 3D Elevation Program (3DEP).

For the 2029 lidar acquisition, the Consortium should be prepared for the FY29 Data Collaboration Announcement, or DCA, which will be available in early spring – late summer of 2028. To fully leverage the USGS’s in-house team of reviewers and data validation specialists, they also recommend using a Geospatial Products and Services Contract (GPSC), which was utilized for the 2024 project. This is a partnership that uses a USGS contractor to complete a lidar acquisition for its national mapping program under 3DEP guidelines.

Other Products

There is renewed interest in adding supplemental orthophoto products into the Consortium portfolio. Some Consortium members are interested in receiving more frequent and higher resolution images between the Consortium's annual releases. The use cases for this supplemental data include taxation and assessment, capital asset management, emergency management, and general planning applications. Results from a Consortium member survey conducted in summer 2024 suggest that there is not enough support for supplemental/subscription-based orthophotos and/or obliques to become a full Consortium product at this time. While these products are not currently mapped in the six-year roadmap as an official product, Metro may pursue a trial of such services and will watch for opportunities to help interested members participate in cost sharing.

Metro and Consortium partners have also discussed cost sharing of **regional lidar derivatives**. There are tentative plans to make the **DEM** and **DSM** provided by the 2024 lidar vendor available in RLIS, along with new **two-foot contours** and **canopy**.

An **impervious surfaces layer** is under consideration for regional coverage, using 2024 data. However, due to the higher costs associated with creating this derivative and its usefulness for mostly urban geographies, Metro recommends creating a customized and further reduced AOI. Those interested in this derivative may opt into this product during the 2025-27 planning cycle. Cost per section will be available in 2025.

Updated **stream delineation** is also under consideration for regional coverage. There are current plans to align these updates with the USGS 3D Hydrography Program effort underway in Oregon and Washington. Members who are interested in this effort and helping fund this update should contact Metro for more information. This coordination will take place outside of the Consortium model.

There are additional lidar derivatives that are not under consideration for regional coverage but may be of interest to specific Consortium members. Metro will solicit and attempt to negotiate unit pricing for on-call contracts that can deliver the following derivatives:

- Building footprints & heights
- Sidewalks
- Vegetation and canopy
- Curb and gutter
- Hillshade raster
- Slope raster

If members are interested in utilizing these contracts to purchase lidar derivatives, they will be responsible for coordinating that purchase. See "Metro Contracts" for more information.

ACQUISITION GEOGRAPHY

Orthophotography (Vertical)

A core area, “Area 1” (see below), is the minimum geography covered for orthophotography for each ortho flight. An additional area, “Area 2” (see below), will be included every other year to coincide with participation of the Consortium members who purchase imagery biennially. These areas are now available to be reviewed by Consortium members on ArcGIS Online via this link: [Photo Consortium Area of Interest Reference Map \(arcgis.com\)](#)

Area 1

Area 1 is comprised of all sections that fall completely or partially within a one-mile buffer of the Urban Growth Boundary. Area 1 may be changed at the request of Consortium members to create a logical, contiguous area or to meet a special need.

Area 2

Area 2 covers all of Area 1 plus contiguous area agreed on by the Consortium. Area 2 is primarily 2-5 additional miles around Area 1. This includes areas of particular interest to Area 1 Consortium members, as well as contiguous areas of 4 sections or fewer that are regularly requested by any Consortium member (the latter is to reduce the administrative overhead of tracking additional areas). Increases to Area 2 will continue to be reviewed every project cycle.

Additional Area(s) / Adjacent Jurisdictions

Additional areas may be added to the flight by request from Consortium members or other agencies. (Example: Area requested by Newberg in yellow on the Area of Interest ArcGIS Online service linked above. Also labeled “Area 8”) Other adjacent organizations that have participated have included Sandy, East Multnomah Soil and Water district, and ODOT (the Oregon Department of Transportation). See Budgeting and Cost Sharing for information on paying for the additional area(s).

Additional product AOI

If a new imagery product (not outlined in the current plan) is procured and the cost shared with Consortium members during this strategic planning cycle, the project area of interest (AOI) will be defined by the Consortium members participating using Area 1 as a starting point.

Lidar

The project area of interest (AOI) will be defined by the Consortium members participating in the 2029 lidar project. The lidar AOI is anticipated to be a minimum of Area 1 and Area 2 but likely to include a much larger area of interest.

BUDGETING AND COST SHARING

The Consortium funding model has been successful for the past 20 years due to its straightforward and egalitarian approach.

Cost Sharing Equation

The Consortium has successfully shared project costs using a cost per section model. The total project cost is determined by adding the cost of data acquisition and processing, Data Acceptance Testing (DAT), and Metro's administrative fee.

A Consortium member's share of the project cost is calculated by dividing the number of sections in their AOI by the total number of sections requested by all members. The more members who participate, the lower the cost for each section purchased. For example, consider a project with a flight area of 300 square miles (sections) at a cost of \$100,000. If 20 agencies opt in and have a total of 1,000 sections in their combined AOI, the cost per section would be $\$100,000/1,000 = \100 . If another agency opts in for an additional 200 sections, the cost per section would drop to $\$100,000/1,200 = \83.33 .

2025-2030 Predictable Cost Sharing Model

In the past, there was no formal opt-in process for participating in an acquisition project; participation was primarily managed through email, and there were no set deadlines. Members could even opt in after the flight had been acquired. While this approach offered flexibility, it lacked budgeting certainty for members. For instance, if a large organization unexpectedly chose to opt out, the costs would rise significantly for everyone.

Beginning with this cycle, members will be expected to opt in or out of projects on a three-year basis during the winter before the first summer flight of the project cycle. This change will offer greater predictability in budgeting for all Consortium members. It will also reduce administrative overhead and allow the Metro project manager to calculate and lock in pricing for each organization. Because of this reduction in overhead, Metro will reduce its admin fees from 20% to 15%. This admin fee will be reviewed annually for potential additional reductions.

Agencies that miss the opt-in deadline may still participate but will be subject to a 10% administrative fee to cover the additional overhead costs. Consortium members should make every effort to meet the opt-in deadline.

A key goal is to ensure predictable and consistent costs for member organizations every year. This will be accomplished by forecasting the costs of their imagery over the three-year cycle, totaling them, and dividing the sum by three. Members will then be invoiced the same amount each spring when invoicing occurs, even if they did not opt into to a purchase in all three years. For example, for the 2025–2027 three-year period, if an organization elects to only purchase 2026 summer imagery, they will be invoiced for 1/3 of that cost over each of the three project years. However, if that organization prefers a single invoice in the year deliverables are received, Metro can offer this flexibility.

If the Consortium's funds exceed forecasts, Metro will assess whether to reduce members' invoices in the final year or reduce the admin fee for the next project cycle.

Project Participation

Members will retain the flexibility to choose which projects they wish to participate in. For example, before the opt-in deadline, a member can choose to participate in just the leaf on and leaf off orthophoto flights, another might opt for just the lidar flight, and a third may opt for just even year orthophotos.

Non-Consortium Area Purchase under the Predictable Cost Sharing Model

In the past, Metro would arrange cost sharing for sections outside Areas 1 and 2 where two or more organizations wished to purchase imagery. This will be changed in 2025–2030; organizations will still be able to use the contract to purchase imagery, but will each pay a standard set price for non-Consortium sections. The primary reasons for this include:

1. Members will be able to make better informed decisions on their AOI needs when the price is set versus if that price might fluctuate based on other organizations' participation (which can sometimes be a moving target).
2. There may be unplanned scenarios when non-Consortium area must be added mid-project cycle (e.g., a need for quick imaging of a recently burned forest). With set pricing for non-Consortium areas, these organizations could better budget for adding AOI on a given year.
3. Coordinating additions to the AOI between the vendor and cost-sharing between interested organizations for non-Consortium areas has required additional coordination for Metro. The new cost sharing model intends to reduce Metro's coordination overhead by increasing transparency around pricing.

Organizations with extensive needs outside Consortium Areas 1 and 2 may prefer to arrange and manage their own flight projects using Metro's contracts, which will be written to support such activities.

The standard set price for non-Consortium areas will be determined after a new contract is in place in early 2025 and made available to the Consortium.

MINIMUM SPECIFICATIONS

Orthophotography

The Contractor will capture the area of interest, as delineated on the Area of Interest map, with a digital aerial mapping camera controlled with AGPS/IMU. The Contractor will meet the resolutions and accuracies as defined in ASPRS (American Society for Photogrammetry and Remote Sensing) Accuracy Standards for Digital Geospatial Data (see Table 4, class III)

<https://www.asprs.org/news-resources/asprs-positional-accuracy-standards-for-digital-geospatial-data>

The Contractor must use industry-standard digital sensor technology and all the accompanying technologies and methods associated with this technology. The camera system must be capable of producing natural color 3-band and color infrared band imagery products at high resolution, from a single flight mission. The raw images must result in orthophotos which are in 4-band TIFF format at 8-bits per band. The Contractor must achieve a nominal forward overlap of 60% (assuming frame-based camera) and lateral overlap of 30%. However, additional exposures must be captured over the urban core area to ensure that no more than 25% of roadway/transportation features are obscured. The Contractor must indicate their proposed ground sample distance (GSD), flying elevations, camera model and camera specifications. The Contractor is responsible for all geodetic surveying data acquisition and processing necessary to meet horizontal and vertical accuracy requirements of the deliverables. The Contractor will use a the most appropriate Digital Terrain Model (DTM) to meet the ASPRS horizontal accuracy specification referenced above.

Leaf-Off Conditions

Leaf-off imagery will be captured between November and March as determined by the weather, leaf cover and other conditional requirements stated in the existing orthophoto contract. The specific timing for the flight will be coordinated with Metro's project manager. Photography shall not be undertaken when the sun angle is less than 30 degrees above the horizon.

Lidar

The lidar flight should be flown in accordance with the USGS Lidar Base Specification

<https://www.usgs.gov/core-science-systems/ngp/ss/lidar-base-specification-online>

Delivery Item	Description
LAS 1.4 PDRF 1	<i>Classified lidar attributed with RGB values, if available</i>
GeoTIFF, tiled by PLSS section	<i>Hydro-Flattened DEM at 3' interval</i>
GeoTIFF, tiled by PLSS section	<i>DSM or First Return at 3' interval</i>
GeoTIFF, 16-bit, tiled by PLSS section	<i>Intensity Returns at 1' interval</i>
Project Index, Arc geodatabase format	<i>Includes lidar flight lines, LAS tiles, raster tiles, boundary, and control.</i>
Hydro-flattened areas, Arc geodatabase format	<i>Water body and stream feature classes of features used for hydro-flattening DEM</i>

Delivery Item	Description
Lidar Project Index LiDAR Technical Report	<i>PDF</i>
SBET data	<i>Lidar swath trajectories</i>
Metadata	<i>FGDC compliant metadata files for each delivery item</i>

Lidar Derivatives:

- Bare Earth or DEM Raster
- Classified ground returns, hydro-flattened features (water bodies >2 ac. and streams >100 ft. wide), and lidar-derived break lines used to create a final terrain dataset in ArcGIS geodatabase format. The terrain is used to then create the Bare Earth or Digital Elevation Model (DEM) at 3-foot intervals. Linear interpolation was used for filling in voids as needed. The DEM grid of points is cut into seamless section-sized raster tiles conforming to Metro’s tiling scheme and exported to GeoTIFF format.
- Highest Hit or DSM Raster
- A highest hit or Digital Surface Model (DSM) created as an Arc terrain dataset using all first return points, excluding those points previously identified as sensor noise. The resulting surface model is used to create a 3-foot resolution grid by using the maximum LAS point elevation value found within each 3-foot cell. The DSM grid of points is cut into seamless section-sized raster tiles conforming to Metro’s tiling scheme and exported to GeoTIFF format.
- Intensity Raster
- Create a grid of points by saving the intensity value of the highest elevation point within each 1 ft² cell. Data are exported to raster format and re-cut into overlapping, section-centered tiles to match the layout used for orthophotography, DEM and DSM.

MEMBERSHIP AND POLICY

Intergovernmental Agreements with Big Players

To maintain regular membership within the Consortium, Metro will require an Intergovernmental Agreement (IGA) for organizations purchasing more than \$25,000 worth of imagery over the total three-year flight period. Only a few organizations within the Consortium meet this threshold. Within the region, these organizations cover over 80% of the project costs and they are considered “Big Players”.

Licensing and Distribution

One key consideration of the Consortium's primary orthophoto contract is the Consortium's ownership of the data. Data ownership is valuable to members because it allows Metro to distribute the data; this means that as a cost sharing member of the data, they also own the data outright. It also allows Metro to build custom web services that can be distributed to members and eventually the public (see below).

While there are no formal Consortium restrictions on public distribution, Metro kindly requests Consortium Members to route both public records requests and purchase requests for aerial imagery procured through the Consortium to Metro for fulfillment. Metro charges a small fee for raw imagery and lidar derivative files to members of the public, to cover the administration of processing.

Storage Policy

Aerial photo and lidar data are a part of Metro's permanent retention schedule. Metro will not delete any imagery, lidar, or related Consortium data and will provide historic data to Consortium members upon request.

Public Access to Orthophoto Web Services

The Metro DRC has been supporting hosted image services for Consortium members for over a decade. Organizations who contribute to an imagery year have exclusive access to the raw imagery distribution and the newest imagery services. In the past, newest imagery services have been defined as the three most recent years of summer orthophotos.

Making imagery products more accessible to the public is a high priority, so this definition will shift to the most recent year of summer orthophotos. For example, once the final 2024 image service becomes available to Consortium members, the 2023 image service will become public (this would be roughly a year and a half after the initial collection date). Leaf-off services will become public at the same time as the summer services that were collected in the same year. This means that the 2024 leaf-off and summer orthophoto services will both be released to the public only once the final 2025 service is available to members in early 2026. The raw hard drive data distribution will remain exclusively available to Consortium members. There will not be modifications to how the current imagery services work (i.e., no support for local download/analysis).

Metro Contracts

The contracts that Metro procures on behalf of the Consortium will be available to the members to use for projects that are not specified in this strategic plan or done on behalf of the whole Consortium. Examples are:

- Smaller groups for one-off flights
- Coordinating flights/contracts with the state

Other Contracts

Metro will, when available and prudent, use contracts obtained by other jurisdictions to reduce cost and improve efficiency in completing Consortium projects.

Big Players

The term “Big Player” comes from a cost model explored in the 2019 and 2024 strategic plan working group sessions. The model suggested billing the organizations with the biggest footprints for the full Consortium area to reduce administrative overhead. While this cost model was not selected, these organizations were identified as key stakeholders of the Consortium. These organizations are the Washington County Geospatial Infrastructure Group (GIG), City of Portland, Multnomah County, and TriMet. Metro will make every effort to engage with these key stakeholders on an annual basis.

State of Oregon

The State of Oregon continues to work on a statewide aerial photo collection program and coordinates data collection flights for their needs. Orthophotos are considered state framework data. As such, they intend to collect statewide 1-foot orthophotos on a bi-annual basis and may continue to offer Master Service Agreements for other imagery products. Supplemental imagery products are further out on the road map.

While the standard 1-foot product does not meet the current specification or distribution timeline needs of the Consortium, Metro is happy to administer and coordinate with the State team to distribute statewide data to interested members in our region. Additionally, should funding opportunities or data exchange opportunities arise, the Consortium will coordinate with the State to leverage public resources and dollars to maximize the benefits to all agencies involved. Metro has an open line of communication with the State via its participation in the Oregon Geographic Information Council (OGIC) and will continue to watch for collaboration opportunities.

Additional Products

Commercial off-the-shelf products continue to advance and are intriguing to many Consortium members, especially with new integrations of AI tools for feature extraction. Metro will continue to monitor available products and evaluate the feasibility of coordinating a purchase through the Consortium. If members are interested in receiving vendor presentations at meetings and learning more about emerging imagery products, they are encouraged to connect Metro with the salesperson to coordinate.