COLORADO
Governor's Office of Information Technology

Peak Perspective:
High-Res Aerial Imagery for Colorado Communities

State:	Colorado
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Contact:	Jackie Montes, Manager-GIS Services (OIT) jackie.montes@state.co.us | 720.288.0570 Nell Conti, Information Management Branch Manager (CDOT) nell.conti@state.co.us | 720.656.0112 Brandi Wildfang, Chief Communications Officer & PIO (OIT) brandi.wildfang@state.co.us | 720.601.5470

EXECUTIVE SUMMARY

Historically, the Colorado Department of Transportation (CDOT) faced challenges with disparate aerial imagery resources, often of lower resolution. A recent survey revealed a significant demand for higher resolution and more frequently updated imagery among CDOT staff and the wider state community.

In a joint project between the CDOT GIS Section and the Governor's Office of Information Technology (OIT) GIS Program, high-resolution imagery was procured from the Vexcel Data Program, an imagery-as-a-service company, providing access to a library of content via a cloud-based platform in 2023. This imagery is now available to all local and state governments, including Metropolitan Planning Organizations (MPOs) and utility districts like Denver Water or 9-1-1 Authorities. Additionally, consultants of local governments, state agencies, utility districts, and MPOs are able to access the imagery for the duration of a project.

Key Uses and Results

- Cost Savings and Efficiency. The initiative saved costs for CDOT and other state agencies by centralizing imagery procurement and distribution. Additionally, the availability of updated imagery streamlined decision-making processes, particularly in construction design and asset management, leading to increased efficiency and reduced project costs.
- Project Design and Progression: The imagery is used for project design, enabling stakeholders to visualize project progression and conduct before-and-after comparisons.
- Asset Management: CDOT and other state agencies use the imagery to update linear and structural assets in GIS, enhancing asset management practices.
- Environmental Monitoring and Mapping: The imagery aids in monitoring environmental impacts and mapping, facilitating accurate assessment and mitigation of environmental concerns.
- Land Use and Land Cover Change Detection: Users leverage the imagery to detect changes in land use and land cover, providing valuable insights for planning and development.
- Disaster Damage Assessment: In natural disasters, the imagery supports rapid and accurate damage assessment, enabling efficient response and recovery efforts.
- Basemap Accuracy: The imagery is an accurate and up-to-date basemap, enhancing the quality and reliability of mapping applications.

Overall, the Colorado Statewide Imagery program represents a significant advancement in visual data accessibility and utilization for state agencies, local governments, and the public, facilitating informed decision-making, cost savings and improved efficiency across various applications and projects.

IDEA

For years, CDOT struggled with having access to lower-quality aerial imagery that wasn't frequently updated. While recognized by CDOT, it was a shared issue among state agencies, counties, local jurisdictions, and other imagery users who needed to share or study high-resolution visual imagery. To address this long standing issue, they conducted a survey to assess the situation and gather insights. From their findings, the CDOT GIS Section and the Governor's Office of Information Technology (OIT) GIS Program, partnered with Vexcel Data Program to provide to all local and state governments, including Metropolitan Planning Organizations (MPOs) and their consultants.

		
This image shows the contrast of desert landscape and agricultural development in Grand Junction, Colorado.	This 3D image of Denver allows for an additional perspective of the built environment in the downtown area. The oblique views provide more context on the height and density of buildings that cannot be extracted from 2D imagery.	This 3D image of I-70 in Vail , Colorado allows for a new perspective of highway infrastructure.

IMPLEMENTATION

A joint project was initiated between the CDOT GIS Section and the Governor's Office of Information Technology (OIT) GIS Program to address these challenges. Starting in Spring 2021, the CDOT GIS section began gathering feedback from agency staff via a survey, and the results indicated they were not satisfied with the current imagery offerings. Staff also responded that they wanted higher resolution imagery (68%), more current imagery (66%), better methods of accessing the imagery (51%), and better statewide coverage (44%). Based on these results, CDOT and OIT began exploring and evaluating imagery vendors. The project team also initiated discussions with the Denver Regional Council of

Governments (DRCOG), which was already providing high resolution for the Denver metro area and adjacent areas, but not at the statewide level. DRCOG was comfortable moving forward with the project and is looking into eventually replacing their imagery project with this one to save costs over the long term. In 2023, imagery was procured from the Vexcel Data Program, establishing a centralized repository of high-resolution imagery accessible to all local and state governments, including Metropolitan Planning Organizations (MPOs) and their consultants.

Despite initial hurdles, such as securing budgetary approval and vendor selection, the project moved forward with the support of key stakeholders and procurement processes. A comprehensive training guide, an acceptable use policy and a training program were developed. Training is offered every two to three weeks and covers how to access the imagery and key terms of use. OIT-GIS used state and public newsletters to communicate the service's initial launch and has included information about the program in presentations at various GIS conferences throughout the past year. The imagery offerings were rolled out to CDOT via agency-wide email communication and presentations at various agency-specific and statewide meetings, including statewide planning meetings and a statewide MPO meeting. Additional products are now being explored, including roadway elements (roadway striping, ADA curb mats, bicycle and pedestrian symbols, etc.), and a statewide digital elevation model and digital surface model.

IMPACT

Access to high-resolution imagery in Colorado has been a game-changer. It has revolutionized decision-making processes, asset extraction and analytical capabilities. Before this upgrade, procuring this type of imagery was costly and difficult to regulate, with various state agencies investing in different resolutions, which led to duplicate expenses for both upfront and long-term storage.

- **Cost Savings.** By centralizing imagery procurement and distribution, the initiative has saved costs for CDOT and other state agencies, potentially eliminating the need for multiple individual programs.
- **Improved Decision-Making.** The imagery is a crucial tool for project design, progression monitoring, asset updating, environmental monitoring, disaster assessment and land use change detection, facilitating informed decision-making and efficient project management.
- **Enhanced Access.** The availability of high-resolution imagery benefits not only CDOT but also other state agencies, local governments, and the public, providing access to valuable data for project design, asset management and decision-making.
- **Collaboration and Efficiency.** Establishing the CDOT GeoHub platform and implementing single sign-on authentication have promoted collaboration and knowledge sharing among state employees, particularly GIS staff, further enhancing efficiency and productivity.

- **Number of Users.** As of April 2024, we have 461 users, including 311 state users and 128 local government users. This initiative signifies a monumental shift towards efficiency and accessibility in leveraging geographic information.

	
Oct. 19, 2018. This image depicts a neighborhood in Superior, Colorado before the Marshall Fire.	Jan. 2, 2022 - Gray Sky Imagery from Vexcel. As part of our service, we receive any additional Gray Sky imagery Vexcel collects imagery after a natural disaster. This image shows the Superior neighborhood three days after the Marshall Fire that destroyed over 1,000 homes in the area.
	
June 21, 2022. Imagery collected six months after the Marshall Fire illustrates no remaining homes in this neighborhood.	April 10, 2023. Imagery 16 months after the Marshall Fire shows the progress of rebuilding homes in the neighborhood.

This imagery is available in a 3D Scene Viewer in an Experience Builder project used by the Division of Fire Prevention and Control to track fires and aid mitigation efforts. The first image has 3D buildings overlaid so one can get a sense of the infrastructure in the vicinity of the fire. The second image illustrates the fuels and terrain near the fire using high-resolution imagery draped over a 3D terrain model.

Up-to-date, high-resolution imagery is critical for fire prevention and control efforts because it provides staff with a realistic and granular picture of the type of vegetation, development, and natural features that exist in the area surrounding a fire. In addition, the Vexcel imagery provides this team with statewide coverage, ensuring that they have these benefits, no matter where a fire occurs around the state. This is a major improvement from various agencies around the state having out-of-date collections in specific areas that may not represent the current landscape.

Below are two examples from the Division of Fire Prevention and Control.

Vision Hills Fire, Pueblo County, April 5, 2024.

Allen Fire, Jackson County, Sept. 30, 2023

From tracking natural disasters to planning sustainable roadways to collecting and maintaining asset location data in Colorado, having a centralized place with high-resolution imagery has proven indispensable. It offers clarity and detail that low-resolution images did not, leading to more informed and efficient decision-making processes for CDOT, state agencies, local governments, and the public. It's not just a luxury reserved for those who can afford to use it—it is open to everyone. That is why we believe this nomination deserves the Information Communications Technology Innovations award!