LAR-IAC3 PRODUCT GUIDE

For the Los Angeles Region Imagery Acquisition Consortium (LAR-IAC) Program 2011-12

LOS ANGELES REGION
LAR|IAC
imagery acquisition consortium

Product Guide Developed by:

Los Angeles County

Pictometry Intelligent Images

SANBORN

Dewberry

March 2012

Orthophotography Data Acquisition & Data Production provided by:
Prime: Pictometry International Corp.
Subcontractor: The Sanborn Map Company, Inc.

Oblique Imagery Data and Viewer provided by:
Pictometry International Corp.

Quality Assurance, Quality Control and Deliverables provided by:
Dewberry

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ATTACHMENT 1 – README – OBLIQUE IMAGERY LIBRARY INSTRUCTIONS

LAR-IAC – BACKGROUND AND OVERVIEW

Please see the original **LAR-IAC Product Guide** for complete background and overview information on the LAR-IAC program. The original LAR-IAC Project Guide (2006) provides plenty of information on the first iteration of the project, orthophotography, digital terrain datasets and oblique aerial digital imagery.

This document can be found online on the LAR-IAC Program Web Site: http://planning.lacounty.gov/LARIAC/resource/doc/ProductGuideFinal.pdf (3.7 MB; 41 pages)

Overview of Data Acquisition Process – LAR-IAC3

Pictometry International Corp. (hereafter referred to as Pictometry) acquired ortho and oblique imagery for the LAR-IAC3 Project. Aerial photography data were collected by Pictometry for all LAR-IAC3 project areas. The Sanborn Map Company, Inc. (hereafter referred to as Sanborn) was the subcontractor on the project for the main ortho production process. Pictometry partnered with Sanborn, a recognized leader in geospatial technologies for the production of high-accuracy digital orthophotos included in previous LAR-IAC projects. Nearly 400,000 nadir image chips were collected simultaneously with Pictometry's oblique imagery collection. The collected nadir image chips were post processed by Pictometry.

To provide stereoscopic coverage for the compilation, Sanborn modified its standard parameters by both adding frames along lines and increasing the frequency of the lines to ensure that the photography would have a minimum of 60% forward overlap between exposures within a flight line and a minimum of 30% side lap between exposures in adjacent flight lines.

To provide the proper geodetic controls for the production of the digital ortho imagery, a combination of existing GPS ground control points and GPS/IMU were employed during the image capture. Existing digital terrain model (DTM) data from LAR-IAC was provided by Los Angeles County and used in the production of the digital ortho imagery. Pictometry accomplished aerial triangulation (AT solution) of the photo set using automatic analytical aerial triangulation (AAAT) procedures in a softcopy environment and the resulting external orientations.

The AT solution and the processed imagery were provided by Pictometry to Sanborn for stereo DTM updates and digital imaging orthorectification. The DTM was updated as needed to support accurate orthorectification by using Softcopy compilation techniques where significant change in the terrain was detected. The DTM tiles containing areas identified by Sanborn as having a significant terrain change were delivered to the County. Sanborn processed orthorectification and produced 3-band (RGB), 24-bit (8-bit per channel) digital orthophotos at 4 inch and 1 foot pixel resolution for respective project areas with no overlap between areas. The 4 inch and 1 foot areas were color balanced independently. The ground resolution of the ortho photography will be approximately nominal 10 cm GSD (Ground Sample Distance) and nominal 28 cm GSD. All products from the LAR-IAC3 Project underwent rigorous quality assurance and quality control (QA/QC) procedures by Dewberry and Davis LLC (hereafter referred to as Dewberry) as an independent QA/QC firm.

All project data were established and produced in the California State Plane Coordinate System (1983, Zone V). The 4-inch and 1-foot pixel resolution orthophotos were delivered by Sanborn to Dewberry for eventual distribution to the LAR-IAC3 participants. Oblique imagery was delivered by Pictometry to Dewberry for eventual distribution to the LAR-IAC3 participants.

PROJECT DELIVERABLES

The LAR-IAC3 Project consists of digital imagery and elevation products in various delivery formats. The LAR-IAC3 Technical Advisory Group (TAG) made every effort to consider and include as many products and delivery formats as possible. While not every format is included, the final products can be converted to other formats, if necessary. The following is a description of all LAR-IAC3 Project Deliverables:

Digital Orthophotography, Digital Terrain Datasets Spot Updates, Oblique Imagery and Viewers

After the quality assurance team receives, reviews, and accepts all of the ortho products delivered by Sanborn for each delivery area, the data is finalized and copied to hard drives for delivery to Los Angeles County and the LAR-IAC3 participants.

The full countywide delivery of oblique imagery, software and support data is also delivered to Dewberry by Pictometry for creation of the Spatially-Limited Dataset (SLDS) deliveries of all project data products to the various LAR-IAC3 participants. The final SLDS datasets will be delivered on external hard drives (provided through the LAR-IAC3 contract).

The delivery extents for each SLDS are defined by two shapefiles developed and provided by Los Angeles County in consultation with each SLDS participant. One shapefile defines the 4-inch (urban) and 1-foot (forest) ortho imagery delivery boundaries, and the other defines the Pictometry (oblique product) delivery boundary.

LAR-IAC3 Project Deliverables (each described below):

There are three (3) main products (now called deliverables) for LAR-IAC3 and over twelve (12) data formats. The main products include:

Deliverable 1 - Color Orthogonal Imagery, 4” resolution (urban areas) and 1’ resolution (national forests), 1’ resolution for urban areas (for Web/public consumption).
Deliverable 2 - Digital Terrain Datasets (DTM) – spot updates from stereo compilation.
Deliverable 3 - Color Oblique Aerial Digital Imagery (with viewer application and other integration software).

Data Formats

Sanborn will translate or transfer the digital data from the original system specific format to the final and required output format. The softcopy photogrammetric data collection software of choice is Bentley Microstation which allows direct translation to Autodesk AutoCAD Map 5 (ACAD2000) dwg format and ESRI ArcGIS format. Pictometry will provide their oblique imagery library, software, and supporting materials. Their oblique imagery format is a

propriety JPEG format. The formats listed below for the listed deliverables are for graphic display only and do not contain any written reports.

Delivery Product	Format 1	Format 2	Format 3
Orthophoto – RGB (4" and 1' products)	GeoTIFF & JPG2000	MrSID (50:1 mosaic and 20:1 mosaic grid) ECW (50:1 mosaic and 20:1 mosaic grid)	SDE Export, file geodatabase, or Mosaic Dataset
Digital Terrain Model (DTM) Spot Updates *	ArcGIS shapefile - points, 3D lines	Microstation (dgn) – points , lines	
Oblique images	Proprietary JPG	Compressed JPG	

* *Digital Terrain Model represents the bare earth terrain including the breaklines.*

Reports and support data:

Ground Control:	ESRI ArcGIS shapefile with attributes ASCII point file listing Report
Tile Grid	ESRI ArcGIS shapefile
Block Adjustment	ESRI ArcGIS shapefile Report

Each participant will receive all delivery formats for the area agreed upon prior to joining the LAR-IAC3 project (provided in their letter of support with the County). For most entities this is their jurisdiction or coverage area along with a buffer area. All products are delivered in the State Plane Coordinate System, NAD83, California, Zone V, U.S. Survey Feet (0405).

Deliverable 1 – Natural Color Orthophotos

1. Four-inch pixel resolution natural color ortho imagery coverage of the urban project area and Santa Catalina Island (Area 1 and Area 3) at a 1" = 100' map scale.
2. One-foot pixel resolution ortho imagery coverage of the national forest areas (Area 2) at a 1" = 200' map scale.
3. One-foot pixel resolution ortho imagery coverage of the urban project area and Santa Catalina Island (Area 1 and Area 3) at a 1"=200' map scale (reprocessed from 4" pixel resolution imagery).
4. Imagery to be delivered as GeoTIFF files (uncompressed) corresponding to each ortho tile in the supplied tile grid.
5. Other data formats to be provided include ECW, MrSID, JPEG2000, SDE export and ESRI File Geodatabase.

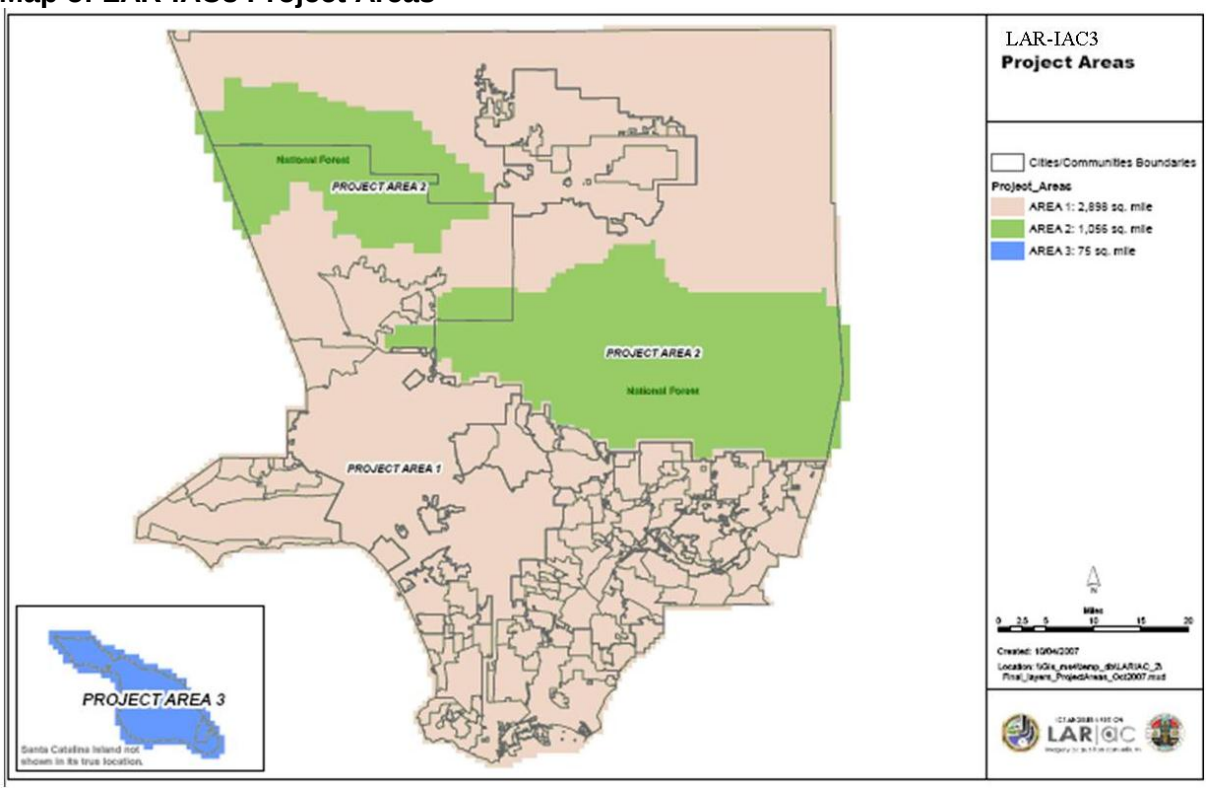
Deliverable 2 - Digital Terrain Datasets (DTM) – Spot Updates

1. Digital Terrain Datasets (updated tiles) from stereo compilation with sufficient point spacing to support generation and rectification of ortho imagery for urban areas and Santa Catalina Island (Area 1 and Area 3).
2. Digital Terrain Datasets from stereo compilation with sufficient point spacing to support generation and rectification of ortho imagery for the national forest areas (Area 2).

Deliverable 3 - Color Oblique Aerial Digital Imagery

1. 4,276 Sectors of Community 2-Way Images covering 4,083 square miles of the County (all areas plus some buffer). This includes 963 Sectors of Community 2-Way Images covering Area 2 (national forests).
2. 3,313 Sectors of Neighborhood 4-Way Images covering Area 1.
3. 139 Sectors of Neighborhood 4-Way Images covering Area 3 (Santa Catalina Island).
4. 16 Sectors of Neighborhood 8-Way Images covering downtown areas.
5. Shapefiles representing the oblique footprint of each image trapezoid in California State Plane Coordinate System, Zone V, NAD 83, and U.S. Survey Feet.
6. Oblique imagery is a proprietary image trailer tacked onto industry standard image format. May be exported to a number of formats. County DTM with up to 2m spacing will be included in image trailer.

Map of LAR-IAC3 Project Areas



Area 1 – urban, Area 2 – national forests, Area 3 – Santa Catalina Island.

Other Deliverables

1. Federal Geographic Data Committee (FGDC) compliant metadata.
2. Geodetic control network for ground control points used for AT solution.
3. Oblique imagery software from Pictometry
   - Electronic Field Study (EFS)
   - Configuration Editor
   - Change Analysis
   - ArcGIS Extension
   - ArcMap Script
   - Network Image Warehouse (NIW)

- ActiveX control - for integrating with other applications (available upon request)

See **Readme** delivered with oblique imagery data products for software information (included here as **Attachment 1**).

DELIVERABLE REVIEW & ACCEPTANCE CRITERIA

All products from the LAR-IAC3 Project underwent rigorous quality assurance and quality control (QA/QC) procedures. The same Acceptance Criteria was used for LAR-IAC3 as LAR-IAC. For detailed information regarding the acceptance criteria, please see the LAR-IAC Product Guide (pages 15 to 20).

Coordinate System and Datum for LAR-IAC3 Project Data

All LAR-IAC3 Project deliverables (except oblique aerial digital imagery) are projected in the State Plane Coordinate System, NAD 83, CA Zone V, US Survey Feet (0405).

Horizontal and Vertical Positional Accuracy

Horizontal Accuracy – For Orthophotos

LAR-IAC3's 4" digital orthophotos were tested in accordance with the 4 inch GSD Acceptance Criteria listed above. The "georeferenced ground positions of higher accuracy," referred to generically as "QA/QC checkpoints," were provided from the first LAR-IAC project and from other data points collected by the vendors. The National Standard for Spatial Data Accuracy (NSSDA) absolute accuracy statistic ($Accuracy_r$) is computed as $RMSE_r$ x 1.7308 in order to report the tested horizontal accuracy at the 95% confidence level as required by FGDC Geospatial Positioning Accuracy Standards, Part 3: NSSDA. The 4" digital orthophotos were tested with **0.7433 feet horizontal accuracy at 95% confidence level.** Class 1 (1 foot accuracy) for Area 1 and 3 and class 2 (2 foot accuracy) are the same standards as LAR-IAC.

Horizontal and Vertical Positional Accuracy - For Oblique Imagery

The *georeferenced ground positions of higher accuracy*, referred to generically as *QA/QC checkpoints*, were provided by LAR-IAC3 from multiple sources. Most checkpoints were X's painted on asphalt, accurately surveyed as control points, and used as *target points* by photogrammetric firms for aerial triangulation. Because these checkpoints are accurate, well-defined and photo-identifiable on the airborne oblique imagery, Dewberry measured the x-, y- and z-coordinates on these checkpoints on each of the 4-view Pictometry images, where visible, to compute errors in Eastings (Δx), errors in Northings (Δy), and errors in elevations (Δz). For each checkpoint, Dewberry also averaged the Eastings, Northings and elevations for all views that were visible; for many, the average resulted from four views, but some points were obscured by buildings, trees, cars, etc., so the average resulted from the mean of three, two, and (in a few cases) only one view.

When coordinates were averaged from north-view, south-view, east-view, and west-view images, the averaged coordinates were normally more accurate than coordinates from individual views, as summarized with the following accuracy statements:

Accuracy of clearly-defined surveyed targets on Pictometry 4-view images with coordinates averaged from all views in which targets were visible and could be measured:

All-view averaged coordinates tested 2.04 ft horizontal accuracy at 95% confidence level
All-view averaged coordinates tested 1.13 ft vertical accuracy at 95% confidence level.

These results are well within contract specifications for oblique imagery for the LAR-IAC3 Project.

OPERATING OPTIONS

The LAR-IAC3 Project is mainly about data products but it is important to note how the data can be viewed and what special software is included or can be used. For detailed information regarding hardware and software requirement, please see the LAR-IAC Product Guide (pages 20 to 23).

LAR-IAC3 product deliverable Index Files (identifying the tile grid, etc.) are provided in ESRI shapefile format. ArcView, or the free ArcExplorer and AccuGlobe applications, and most other GIS software can read the index shapefiles included with the data.

Other LAR-IAC3 Project reports (Horizontal and Vertical Accuracy, Aerial Triangulation, Geodetic Control, etc.) are provided in Adobe Acrobat (.PDF) file format. Other miscellaneous data tables can be opened and used with a word processing and/or spreadsheet application like Microsoft Word or Microsoft Excel.

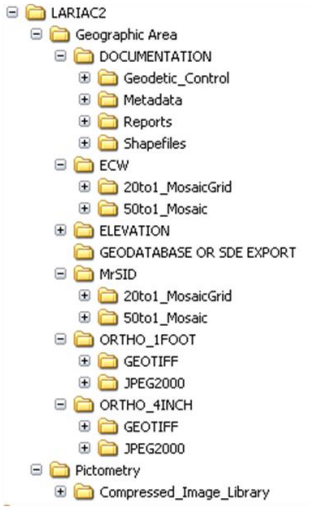
ACCESSING OR LOADING DATA

The following section refers to accessing and/or loading the LAR-IAC3 data. Most agencies are receiving their data on an external hard drive (provided this time through the LAR-IAC3 Project). See the original LAR-IAC Product Guide regarding Data Loading (pages 24 and 25).

2011 LAR-IAC3 Ortho Data Products Folder Structure

The following folder hierarchy details the folder structure for the LAR-IAC3 Ortho Data Products.

Folder Structure:



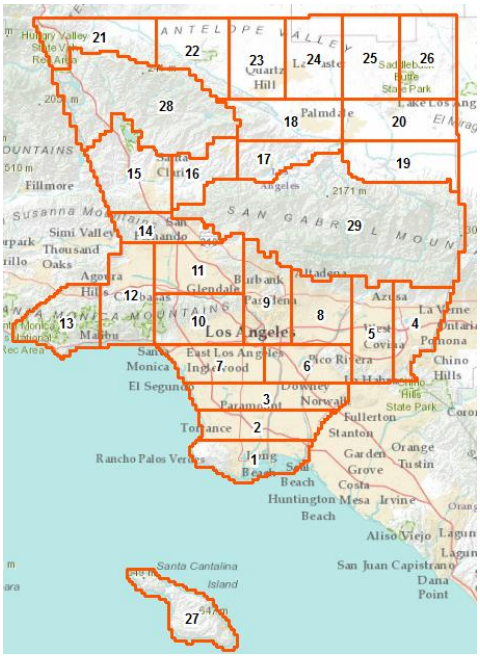
Oblique Imagery File Structure

See **Readme** delivered with oblique imagery data products for this information (included here as **Attachment 1**).

Orthophotography – Delivery Blocks, Tile Counts, Tile Grid and Tile Naming Convention

Delivery Blocks (AT Superblocks):

The LAR-IAC3 Project is divided into large blocks (formerly called delivery areas and sometimes referred to as AT Superblocks) and each area is divided into delivery tiles (the smallest grid for the project). Each tile represents an orthophoto tile. The size of the grid and tile counts are below:



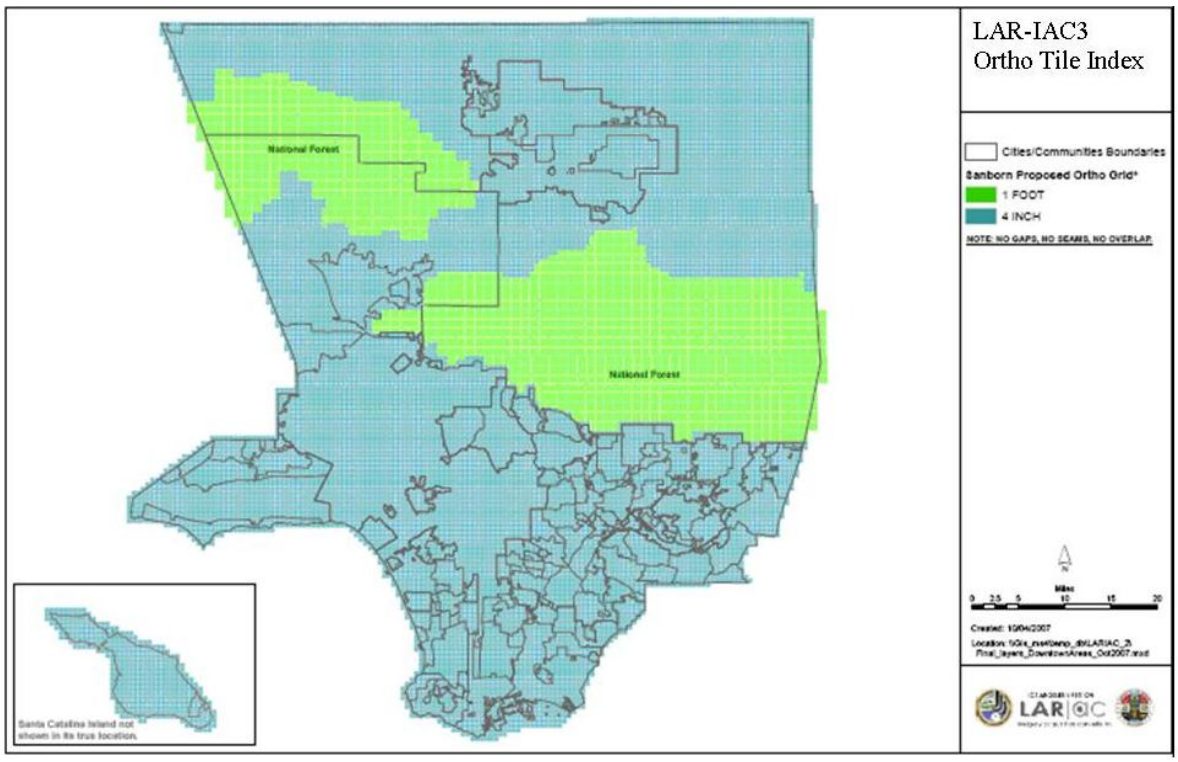
Map of project delivery blocks (ortho products)

Tile Counts:

12,302 tiles for 4” orthos and digital terrain datasets (Area 1 – urban)
1,080 tiles for 1’ orthos and digital terrain datasets (Area 2 – national forests)
428 tiles for 4” orthos and digital terrain datasets (Area 3 – Santa Catalina Island)

Tile Grid:

Tiles for Area 1 and Area 3 – 0.25 sq. mile area, 0.5 mile length and width
(2,640 ft. x 2,640 ft.)
Tiles for Area 2 – 1 sq. mile area, 1 mile length and width
(5,280 ft. x 5,280 ft.) – some tiles (along the edge of Area 1) are 2,640 ft. x 2,640 ft.



Map of tile grids (ortho delivery products).

Tile Naming Convention – Tile ID:

In order to be able to work with the tiles, it is necessary to have a unique naming convention that uses a deterministic process to identify both the geographic location, as well as the type of data product and format. Each 1-foot tile name is a 12-character ID. The first three characters, “L3_”, distinguish between LAR-IAC2 and LAR-IAC3 data files. The latter part of the name consists of a truncated X coordinate (first 4 digits) in thousands of feet, separated with an underscore from a truncated Y coordinate in thousands (last 4 digits). Each 4-inch tile name has an additional a, b, c, or d quadrant designation.

Examples: **1-foot tile** **4-inch tile**

L3_6550_1762

Truncated X Coordinate

Truncated Y Coordinate

L3_6550_1762a

Tile location – same 9 characters as the 1-foot tile

Additional a, b, c, or d quadrant designation for 4-inch tile

Sample 4-inch tiles with the LAR-IAC3 tile grid and naming convention.

All of the core orthophotography files are identified by this tile number and a file extension that designates the files data file format (e.g. .tif or .jp2). For all of the other LAR-IAC3 data products, the 12-character ID is followed by a product type identifier (suffix). The file type (product) suffix starts with an underscore and is followed by a 2- or 3-character product type designation, consisting of:

_1	1-foot resampled ortho tile
_dem	digital elevation model data
_dtm	digital terrain model data

NOTE:

Following each file name is the file extension. The extension begins with a period and then a 3 (or more) character string designation of the data format (e.g., .dwg, .dgn, .shp, .xyz, etc.).

CREDITS - HOW TO CITE THE LAR-IAC3 DATA

The mapping products provided under the LAR-IAC3 Project are an important operative component to all consortium participants and have significant value. This value must be protected by all consortium participants and parties affiliated with LAR-IAC3 and its contractors. When using the LAR-IAC3 datasets for public viewing, media or third party applications, Los Angeles County strongly encourages its LAR-IAC3 participants to properly cite the source of the data.

NOTE: Third party or "derived datasets" created from the LAR-IAC3 data are not subject to citation requirements.

Citing Pictometry/Sanborn Data (ortho products)
When citing the source of the Pictometry/Sanborn data please use one of the two following options:

Option 1 - Short Version:

> "This is a proprietary dataset provided courtesy of the Los Angeles Region Imagery Acquisition Consortium (LAR-IAC), Pictometry International Corp. and The Sanborn Map Company, Inc."

Option 2 - Long Version:

> This is a proprietary dataset provided courtesy of the Los Angeles Region Imagery Acquisition Consortium (LAR-IAC), Pictometry International Corp. and The Sanborn Map Company, Inc. Use other than what is allowable under license or by written permission from Pictometry International Corp. or The Sanborn Map Company, Inc. will be considered unauthorized and may be punishable by law. Permission for external use may be given with written permission from Pictometry International Corp. or The Sanborn Map Company, Inc.

Citing Pictometry Imagery (oblique products)
When citing the Pictometry oblique imagery please use the following:

> "© Copyright 2008, Pictometry International"

Let Us Know How You Are Using the LAR-IAC3 Data

We want to know about your successes! The LAR-IAC3 Technical Advisory Group will be documenting how people are using the LAR-IAC3 products. This valuable information will help Los Angeles County present a strong business case to decision-makers for maintaining the County's geographic information systems (GIS) infrastructure. Please send a few sentences about how you are using the data to gis@planning.lacounty.gov.

LAR-IAC3 PROJECT HELP

For help using the LAR-IAC3 data products, users can contact:

Los Angeles County Chief Information Office
Project Director – Mark Greninger, Associate CIO (County GIO)
mgreninger@cio.lacounty.gov (213) 253-5624

Los Angeles County Department of Regional Planning – Community Outreach – Nick Franchino, GIS Manager
gis@planning.lacounty.gov (213) 893-0881

LAR-IAC3 Project information can be found at the project Web site:
http://planning.lacounty.gov/lariac

For Technical Assistance with hard drives or delivery:
Data Quality Assurance and Distribution by:
Dewberry & Davis LLC
8401 Arlington Boulevard
Fairfax, VA 22031-4666
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CITATIONS

All citations should reference the original LAR-IAC Product Guide (pages 34 and 35).