FINAL REPORT
US ARMY CORPS OF ENGINEERS

GIS Collection & Verification Program

Transportation, Facility, & Recreation Assets

2018 – 2025 Completed National Dataset

Program Staff: Peter Gernsheimer & Jamie F. Weleber

Executive Summary

The Student Conservation Association

The mission of Student Conservation Association (SCA) is to build the next generation of conservation leaders and inspire lifelong stewardship of our environment and communities by engaging young people in hands-on service to the land.

SCA was founded in 1957 by Liz Putnam, a college student who believed that the passion, talent, and hard work of young people could be a force for tackling the challenges facing America's public lands. Today SCA provides opportunities for thousands of young people to develop conservation values and explore pathways to green careers, strengthen their leadership skills, and deepen their sense of responsibility to others and to the world. Young people emerge from SCA with fuel for their continuous growth and with a sense of empowerment to take action for the issues that they care about, in conservation and beyond. SCA nurtures thriving youth and thriving landscapes.

SCA Founder, Liz Putnam

The US Army Corps of Engineers

The US Army Corps of Engineers (USACE) is the first federal agency, having been founded in 1775 by the Continental Congress. Since the General Survey Act of 1824, USACE has mapped and managed waterways across the country. This has grown and expanded over time to include creating and managing many of the dams across the country. Today, USACE manages over 400 water resource projects domestically, divided into geographic Divisions, then Districts based on dominant watersheds.

Project Overview

USACE recreation sites receive some of the highest visitation of any areas in the federal system. With this in mind, the agency became eligible for Federal Lands Transportation Program (FLTP) funding in 2012 to support improvement of USACE public roadways and parking areas. Further, USACE utilizes Recreation.gov, an online reservation service for federal land agencies designed to streamline the visitor experience. As geospatial data is critical to both programs, USACE identified the need for an expanded and improved database representing its varied transportation and recreation assets. These improved datasets would enable USACE staff to view, analyze, and share data in ways not previously possible that will ultimately improve public access and the experience of USACE recreation offerings.

As mentioned above, geospatial data is a necessary component for two programs supporting USACE recreation – FLTP and the Recreation.gov website. With a comprehensive spatial inventory of the district's road and parking network, the agency is eligible for FLTP funding to maintain and improve public transportation facilities. USACE roads are heavily traveled, especially in peak seasons, and the quality of such facilities invariably influences visitor access and ease of navigating recreation sites.

Further, for many recreationists hoping to visit public lands, the Recreation.gov website is part of the pre-trip planning process – site-specific information, campsite and picnic reservations, trail permits, and more are available for the twelve partner agencies including USACE. An improved spatial database of recreation assets will allow USACE to expand their website presence, thereby streamlining visitor

preparations with new offerings and information. This is also sure to attract individuals previously unfamiliar with the variety USACE offerings, thus boosting the agency's reputation for managing recreation destinations.

While these are the most important and anticipated benefits, there are other ways in which USACE sites will benefit from updated geospatial information. For example: road network data can be shared with Emergency Management Agencies to improve public safety and response times; maps can easily be made with internal and/or public relevance; and context will be available for additional spatial datasets (e.g., the location of other USACE assets will be easier to interpret when overlaid on a map containing the provided road network and recreation assets).

Project Implementation - GNSS

2016 – 2018 Pilot Programs

USACE selected SCA as the partner organization to test how to generate these high-quality geospatial datasets in 2016. That year, a small team began the process of field-collecting and verifying paved assets, buildings, and recreational facilities across the Sacramento district. The team utilized survey-grade GNSS receivers to geolocate road centerlines, building mid-points, and a host of additional other features.

While field-collected data was the foundation of the project, as it ensures a high level of data integrity, additional efforts were needed before arriving at a finished product. After importing and refining the data using specialized desktop software, review meetings were held at each project site to further ensure the database accurately represents USACE transportation and recreation assets down to a level of fine detail.

Matt Duarte utilizing a Trimble Geo7x for field collection.

Although this system proved effective and accurate, there were deficiencies noted which would need to be addressed in future programming iterations. First, survey-grade accuracy was a level of detail too precise for this type of work. When creating GIS datasets, there is often an inverse correlation between accuracy of field collection and speed of field collection. While the 2016 program did create highly accurate data, the time taken to do so was unsustainable and expensive.

Another noted deficiency with the original pilot program centered on USACE Project-level staff involvement. As noted earlier, the team would brief the field staff on the dataset at the conclusion of

the field collection and post-processing effort. However, it was not possible to let USACE staff interact with the dataset while the field collection process was ongoing, prior to the final data review.

The last area where possible improvement was noted involved cost. Here, cost was exacerbated by 2 factors: equipment and efficiency. The survey-grade GNSS equipment used by the initial team cost roughly $5,000 per member. This made the program difficult to scale without dramatically increasing cost. In relation to efficiency, the 2016 team's workflow was entirely offline, siloed on each individual GNSS receiver. This made it difficult to rapidly see, and thus error check, each day's work.

Efficient field collection utilizing Trimble Catalyst, Motorola Moto G Power phones, and ESRI Field Maps.

2020-2024 Program

The 2020-2024 seasons launched with refinements and alterations which addressed all the above-mentioned issues. The team would utilize the latest software, hardware, and methods to enable efficient, scalable data collection and verification. SCA and USACE have worked diligently to create a data structure which enables scalable, efficient, and secure data collection and verification. SCA created a field collection system which utilizes a cloud-based GIS solution, powered by ESRI, ArcGIS Online (AGOL). This cloud platform enables field collectors to sync data directly to the cloud, every day they are working. Having a centralized cloud platform also allows USACE project staff to view the data as it comes in from the field; monitoring it as much or as little as they wish. SCA staff created an online portal where USACE staff could log-on to view and query the data as it returned from the field. This was utilized numerous times to help catch errors early, allowing field teams to make corrections before more time was invested in post-processing incorrect original data.

To address the accuracy issue noted above, SCA partnered AGOL with the Catalyst subscription GNSS service by Trimble. Working closely with USACE, SCA was able to purchase a subscription package tailored to the accuracy needs of the work. This allowed the teams to spend less time collecting each individual feature class, increasing efficiency.

Equipment costs were also dramatically reduced compared to previous systems. Instead of utilizing traditional technology where GNSS antennas and receivers were combined into 1 device, SCA utilized a system where those 2 pieces of technology are broken apart. Instead of spending thousands of dollars per member for equipment, SCA was able to outfit members with relatively inexpensive smartphones which would handle the GNSS receiver duties while the Trimble Catalyst antenna supplied time encoded signals from satellites. Overall, the initial cost per member was reduced to under $500, from a previous mark of over $5,000.

The GIS Collection & Verification teams went out every day and collected geospatial and attribute data for paved surfaces and recreation facilities on USACE property across all districts. Full census data was collected on USACE managed project service areas; road and parking data was collected on out-granted areas within fee land. This way the visitation and recreation programs have consistent maps and data

across all field projects surveyed and the district has consistent road and parking maps and data for their participation in the Federal Land Transport Program across the entirety of the fee land.

Field work was primarily an exercise in collecting new data as it quickly became apparent that trying to alter existing data into the current schema was more time-consuming than fresh data collection in the field. A specific example of this can be found in the road network. Where to begin and end a road segment is very from a simple task and can generate significant differences in the total number of road segments comprising a transportation network. That difference in the number of road segments directly impacts additional workflows, such as Operational Condition Assessments.

Participant Impact

In every SCA experience, participants complete projects that solve real conservation challenges and see the tangible results of their labor. Through this work they learn how to conserve resources, protect the planet, learn why their conservation work projects are critical to that effort, and discuss with teammates what they could do to address environmental issues after SCA; including exploring possible careers in conservation or green jobs and discussing their academic and career goals. SCA experiences provide participants with opportunities to lead their peers, engage in problem-solving, conflict resolution, and group decision-making, and ultimately reflect on the ways the experience is impacting them.

"I came in with very limited GIS experience, so I felt that I learned a ton and am well set up for a career that involves GIS. This was also my first job out of college, so I felt that I got a good foundation in a lot of general skills like working with a team, logistics and planning, being a project leader, and communicating with USACE/supervisors." *Elsa Erling, 2022 Member*

Members in the GIS Collection & Verification program got to develop in-depth expertise in GIS software, hardware, and field applications. The team used several pieces of ESRI and Trimble software and hardware; ArcGIS Pro, Fieldmaps for ArcGIS, ArcGIS Online, and Trimble Catalyst GNSS receivers. As more conservation jobs begin finding ways to incorporate GIS into their base level work, GIS Collection & Verification program members developed real world skills which will enable them to compete for professional level GIS positions in a wide variety of conservation areas.

Additionally, SCA empowered program members to build leadership skills through direct experience managing their small teams. This took place through a rotational peer-leadership model that enabled each member of the crew to take on certain responsibilities, such as daily reporting and logistical scheduling of data collection efforts. This rotating position was referred to as the Project Lead, which changed per Water Resource Project. This enabled members enough time to grow into their new role, while being closely supported by the Program Coordinators and Program Manager.

Providing this opportunity had multiple beneficial effects for the members and the program. First, it created a feeling of comradery and accountability within the crew, as each member took a turn recognizing the responsibilities and difficulties that come with leading a crew. During their time leading, members would also receive active mentorship and real time feedback from their highly experienced SCA staff, as well as that of their fellow team members. Programmatically, the Project Lead simplified logistics as they acted as a Point of Contact for local USACE staff as well as SCA staff.

Work Totals

Feature Category	Count
Boat Ramps	3,762
Bridges	691
Buildings	4,217
Campgrounds	629
Campsites	32,074
Fishing Features	447
Marinas	382
Picnic Sites	16,386
Recreation Features	1,692
Road Points	6,579
Structure Points	10,602
Traffic Counters	3,618
Trailheads	2,593
Road Segments	39,532
- Road Mileage	6,796
Parking Areas	31,205
- Parking Sq Footage	336,669,708
Recreation Areas Completed	4,644
States	43
Member Hours	55,627

Products

PDF Pages – Park Plates & Asset Details Reports..... **75,459**

Websites – Product Download, Project EAGLET, & USACE Staff Portal.....**2**

Geodatabases.....**1**

Acknowledgements

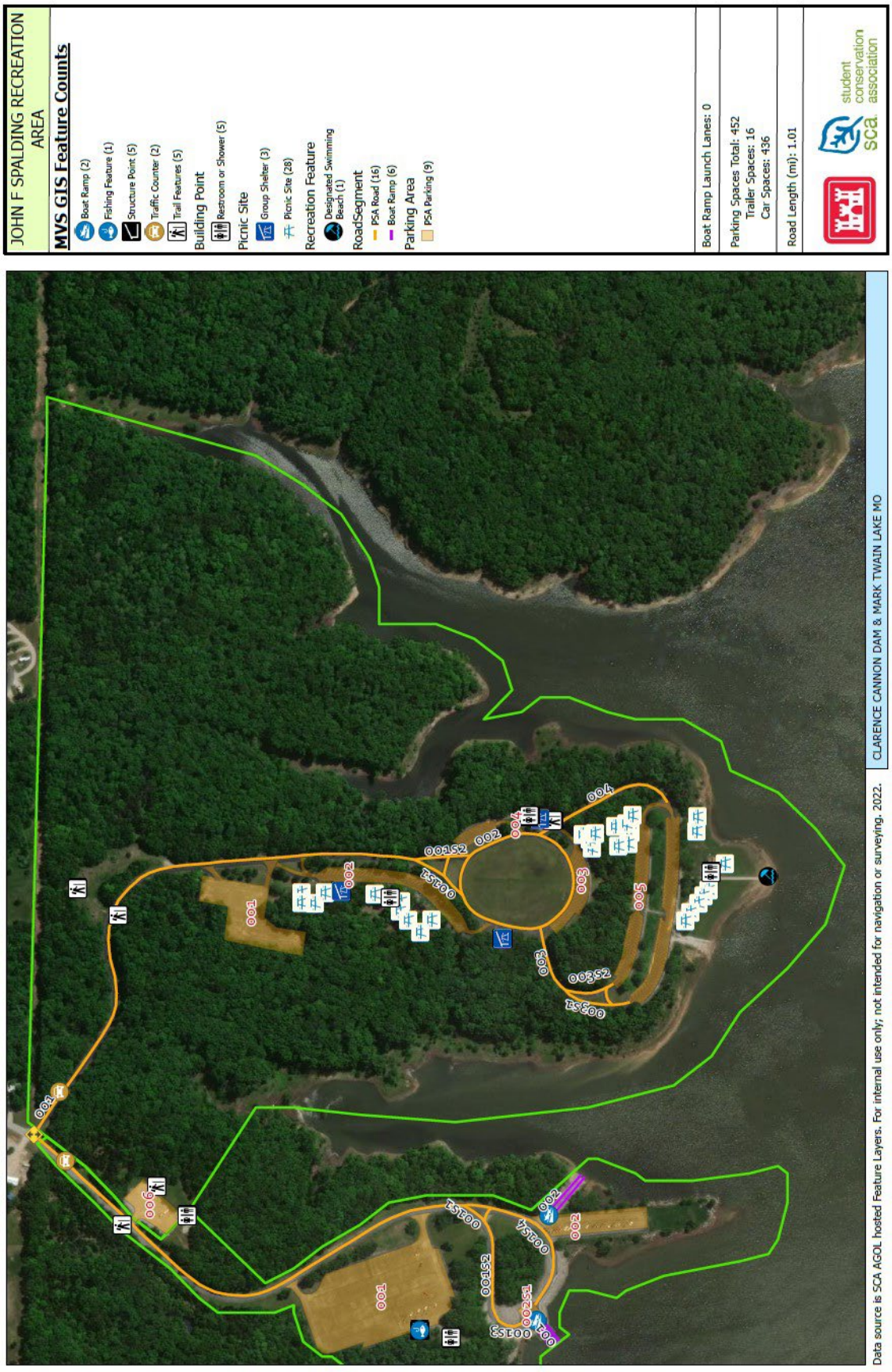
The GIS Collection & Verification Program would like to thank the many people who have assisted this program. We would like to thank Meredith Bridgers, Ben Silvernail, Zach Noordhoff, Andrew Huddleston, Ashleigh Boss, and Daniel Taylor from USACE for collaborating with SCA on this program and assisting us throughout with modifying estimates, data dictionary definitions and instructions to have the most useful outputs possible. We would like to thank the field staff at every USACE project office we worked at for supporting us while on site. We would like to thank the office and support staff at every USACE project office we worked at for sharing their space and resources with us, at times with little to no advanced notice of our arrival as flood waters and COVID-19 pushed us around the country.

The Members

This program was a success because of the hard work, perseverance, feedback and intelligence of our members. This program offered so much but it was incredibly difficult as well. Living out of a duffle bag for months on end, never staying in the same place for more than a week or so, the rapid pace of travel was the allure yet also the obstacle to overcome. On behalf of the staff at SCA and USACE, we say thank you. We wish you the best in all your future endeavors!

- Albert Yue
- Alonso Santos-Gonzalez
- Amber Rooney
- Andrew Kopchynski
- Angela Flores
- Ann Nelson
- Ashley Chastain
- Aurora McKnight
- Benjamin Kehoe
- Brandon Ferguson
- Briana Urizar
- Byanca Moreno
- Catherine Atwood
- Catherine Tso
- Chance Feemster
- Christine Cieslak
- Cody Pulich
- Conrad Bekta
- Dan Goldeen
- Eleanor Crane
- Elena Nirgiotis
- Elizabeth Becker
- Elsa Erling
- Emily Eitel
- Emily Kuhl
- Erin Howe
- Grace Bridy
- Ian Eberly
- Ilana Goldin
- Jaqueline Joya
- Jennifer Perez
- Jennifer Rogers
- Julia Cepis
- Julia Roedel
- Kailee Dolezal
- Kigen Mares
- Kimberly Bischoff
- Madeleine Soss
- Maegan Wettlaufer
- Malek Derhammer
- Margaret Keller
- Mariela Quezada
- Matthew Stoner
- Michael Santangelo
- Nathan Napier
- Nicholas Barba
- Olivia Kennedy
- Sarah Nichols
- Shannon Kelly
- Steven Hertel
- Sydney Emley
- Tamara Popovska
- Theron Blunck
- Tracy Lyons
- Trevor Roberts
- Zach Kitchens
- Zoe Kane-Preissing

GIS Park Plate Sample



Products | GIS Asset Detail Samples

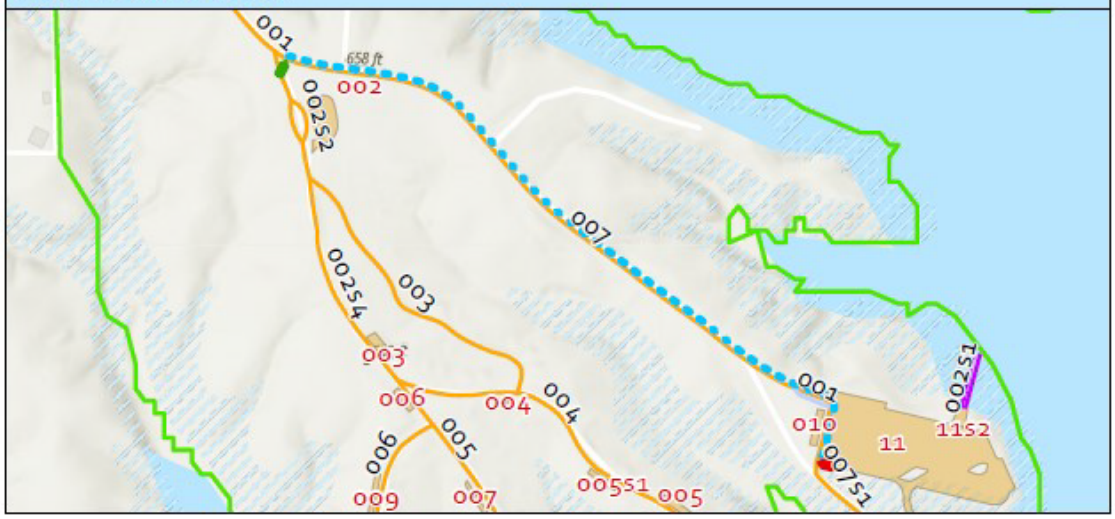
US Army Corps of Engineers

student conservation association

MVS Road Segment Report

LAKE SHELBYVILLE IL

PSA ID: OPOSSUM CREEK



Categorical	Primary Key	**191-316691001-2-007**
	Road Segment Name	**OPOSSUM CREEK BOAT RAMP ROAD**
	Road Segment Description	OPOSSUM CREEK BOAT RAMP ROAD
	Road Asset Type	Road
	Category Code	PSA Road
	Facility Type (Project & PSA Only)	Two-Way Roadway
	Road Segment Status	Open to Traffic
	Managed By	Corps of Engineers
	Maintenance Operations	Corps of Engineers
	Ownership	US Army Corps of Engineers
	State	IL
Physical	Road Length *(miles)*	0.41
	Surface Material	Asphalt
	Width *(ft)*	22.00
	Lanes	2
	Striped	Yes

Lanes *(lanes)*

- When striped lanes were present, field collectors used this number.
- When striped lanes were NOT present:
  - For one-way roads – always listed **one lane**, unless any type of road paint indicated otherwise (ex – striping, 2 arrows side-by-side)
  - For two-way roads:
    - If the road width is less than 16ft, marked as **one lane**
    - If the road width is 16ft or greater, marked as **two lanes**

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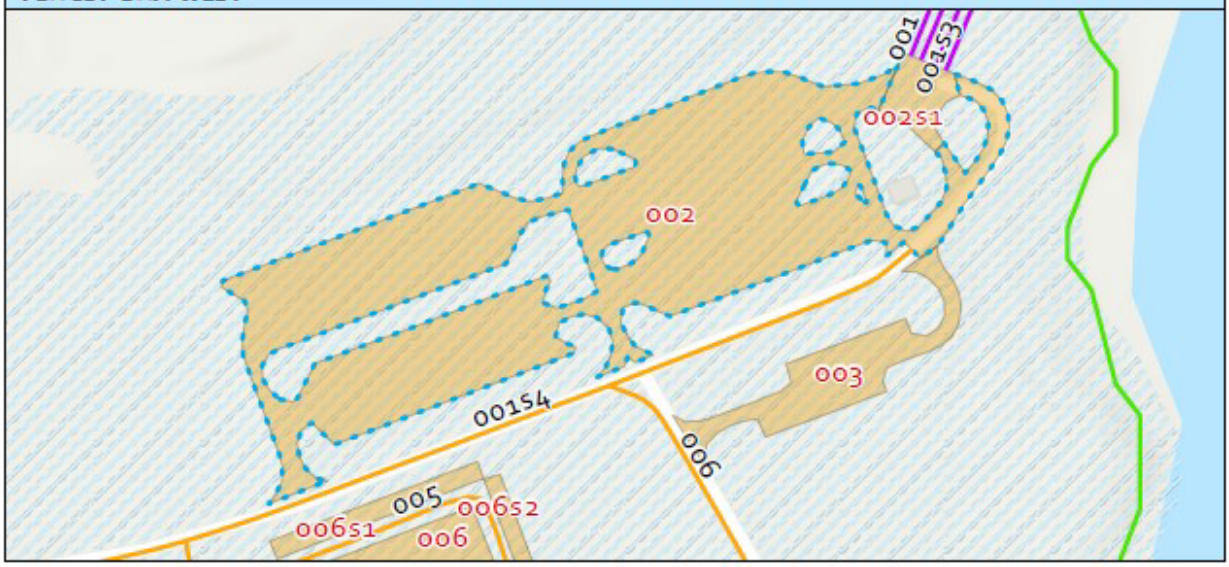
MVS Parking Area Report

LAKE SHELBYVILLE IL

PSA ID: DAM WEST



Categorical	Primary Key	**191-316691007-5-002**
	Parking Area Name	**DAM WEST BOAT RAMP PARKING**
	Parking Area Description	DAM WEST BOAT RAMP PARKING
	Parking Asset Type	Off-Road
	Category Code	PSA Parking
	Parking OMBIL Category	Day Use
	Operational Status	In Service
	Managed By	Corps of Engineers
	Maintenance Operations	Corps of Engineers
	State	IL
	User Access	Public
Physical	Area *(Square Feet)*	149,982.47
	Surface Material	Asphalt
	Car Spaces	0
	Trailer Spaces	150
	Striped	Yes

Asset Type *(assetType)*

- **On-Road** – Parking spaces are accessible directly from travel lanes on roadway. Usually parallel, perpendicular, or angled parking spaces relative to roadway.
- **Off-Road** – A vehicle must enter a parking area before accessing an individual parking space
- **Terminal** – Road ends at parking area, with no other roads leaving from the parking area

OMBIL Category *(ombilCategory)*

- "Day Use" – All other parking not associated with overnight camping facilities
- "Camping" – Parking offered only for, or associated with, overnight camping. This parking type must be associated with PSAs with Primary Area Subtype of either 'Campground' or 'Multipurpose'

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