—Technical Publications—
Sources for Parking Demand Studies

Zoning Ordinance
Advisory Committee

June 18, 2020

Outline

- Parking Demand
- Technical Publications
  - ITE's Parking Generation Manual
  - ULI's Shared Parking

Purpose

- The following slides summarize a description of two publications traditionally referenced in parking demand studies.

Parking Demand

- Parking Demand is the amount of parking generated at a specific time, place, and price.
- It is a critical factor in evaluating parking problems and solutions.

Parking Demand

Parking demand considerations:

- Parking supply *(Is there ample parking?)*
- Vehicle ownership
- Trip rates
- Mode split *(Is transit an option?)*
- Turnover *(how long motorists park)*
- Geographic location *(downtown, suburban)*
- Quality of travel alternatives and frequency
- Trip type *(work, shopping, recreational)*
- Price *("free" parking, fuel, toll, fees)*

Parking Demand

- Estimating parking demand is a value judgment rather than a scientific exercise.
- Studies should still rely on reference sources.

Technical Publications

Selected reference sources for parking studies:

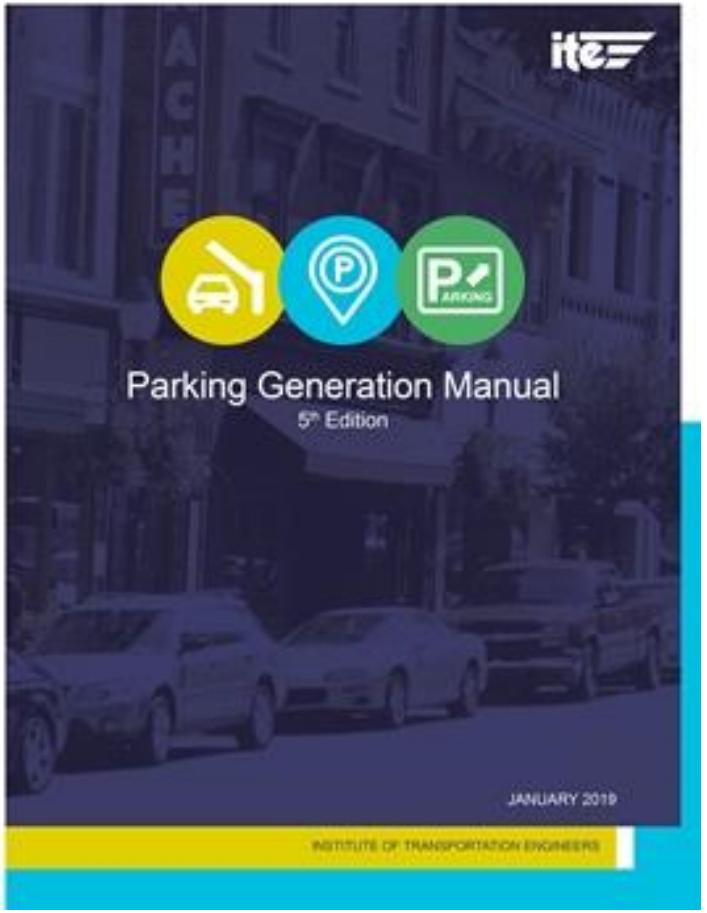
- Empirical data collection
- Parking Generation Manual, 5th edition, Institute of Traffic Engineers, 2019
- Shared Parking, 3rd edition, Urban Land Institute, 2020

Parking Generation Manual

Parking Generation Manual, 5th edition, Institute of Traffic Engineers, 2019

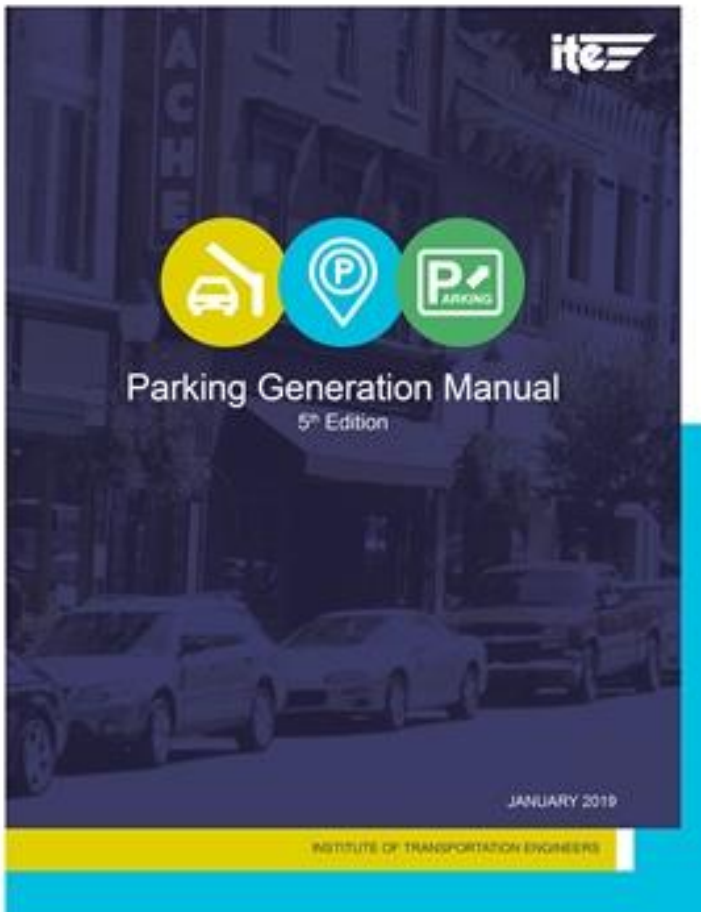
Parking Generation Manual

- Published by ITE
- It is a collection of parking demand data observations by land use type.



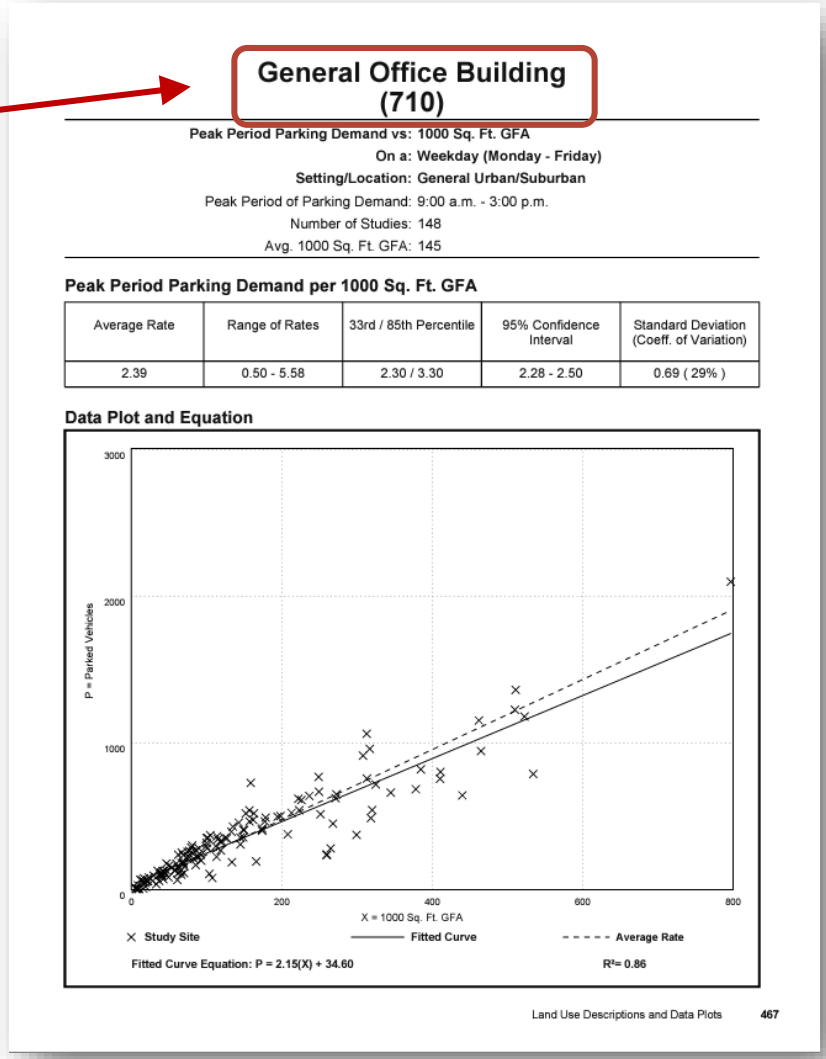
Parking Generation Manual

- 5th Edition (2020) Update
  - 19 new land use classifications
  - Data from 1,700+ sites
  - Refined to ensure relevancy by removing all data prior to 1980
  - Re-examination of existing data resulted in several changes to land use codes, independent variables, and land use description



Parking Generation Manual

- Consists of:
  - Land Use



General Office Building (710)

Peak Period Parking Demand vs: 1000 Sq. Ft. GFA
On a: Weekday (Monday - Friday)
Setting/Location: General Urban/Suburban
Peak Period of Parking Demand: 9:00 a.m. - 3:00 p.m.
Number of Studies: 148
Avg. 1000 Sq. Ft. GFA: 145

Peak Period Parking Demand per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	33rd / 85th Percentile	95% Confidence Interval	Standard Deviation (Coeff. of Variation)
2.39	0.50 - 5.58	2.30 / 3.30	2.28 - 2.50	0.69 (29%)

Data Plot and Equation

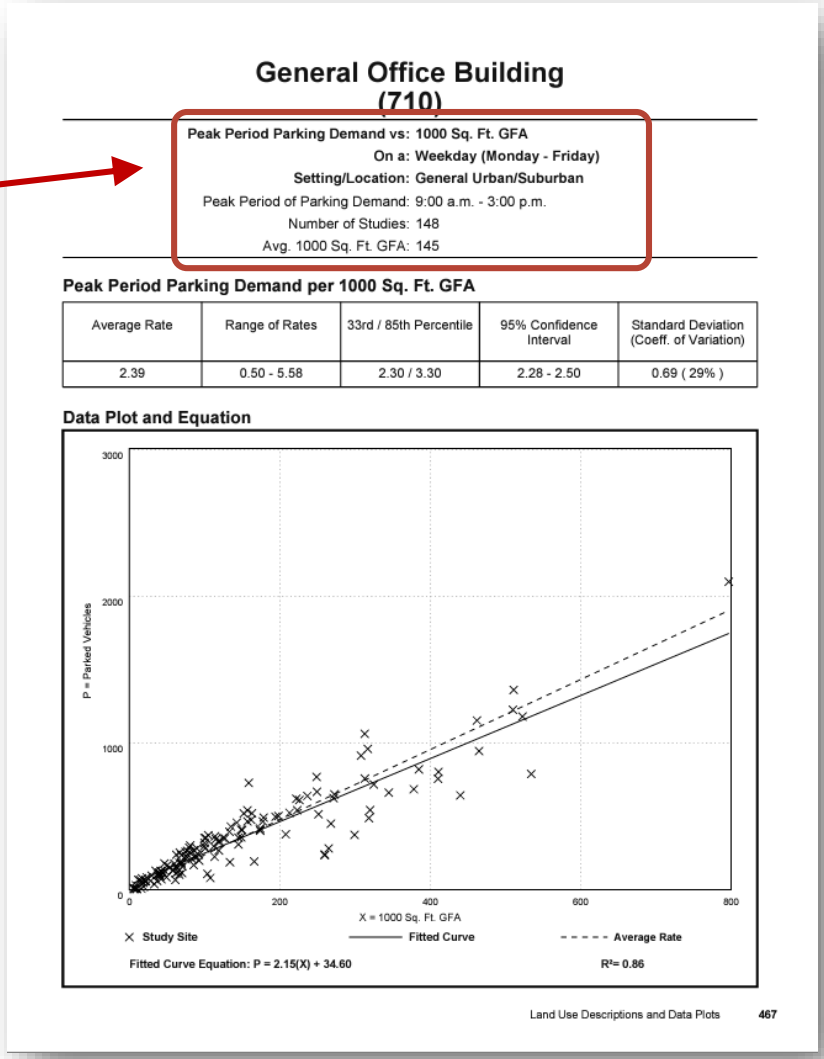
Land Use Descriptions and Data Plots 467

City of Dallas

Parking Generation Manual

- Consists of:
  - Land Use
  - Variables

Setting/Location—5th edition introduced urban data



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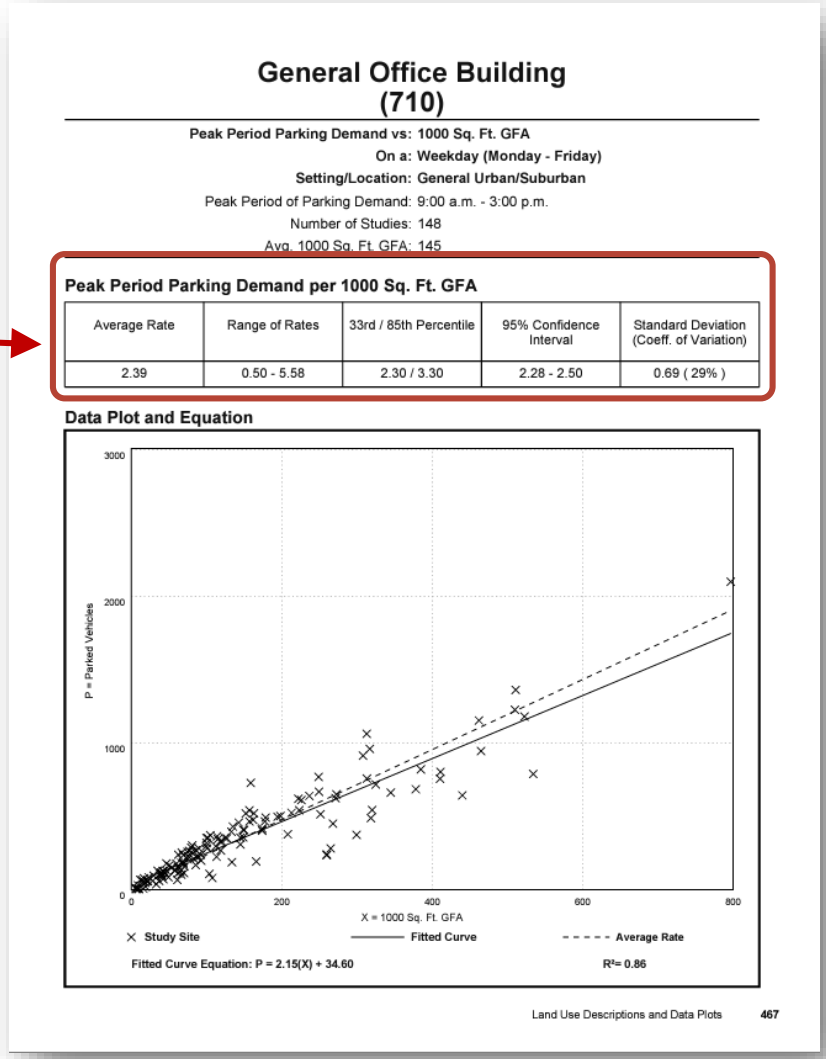
Data Plot and Equation

Land Use Descriptions and Data Plots 467

City of Dallas

Parking Generation Manual

- Consists of:
  - Land Use
  - Variables
  - Statistics



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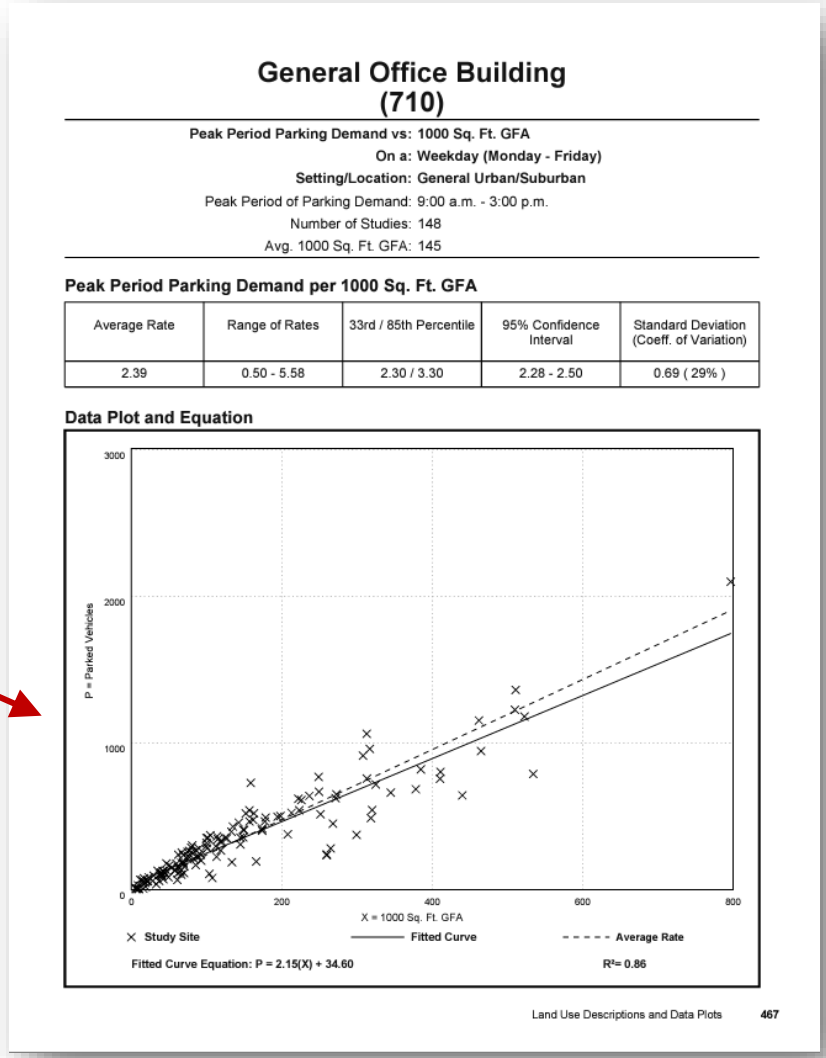
Data Plot and Equation

City of Dallas

Parking Generation Manual

- Consists of:
  - Land Use
  - Variables
  - Statistics
  - Plot



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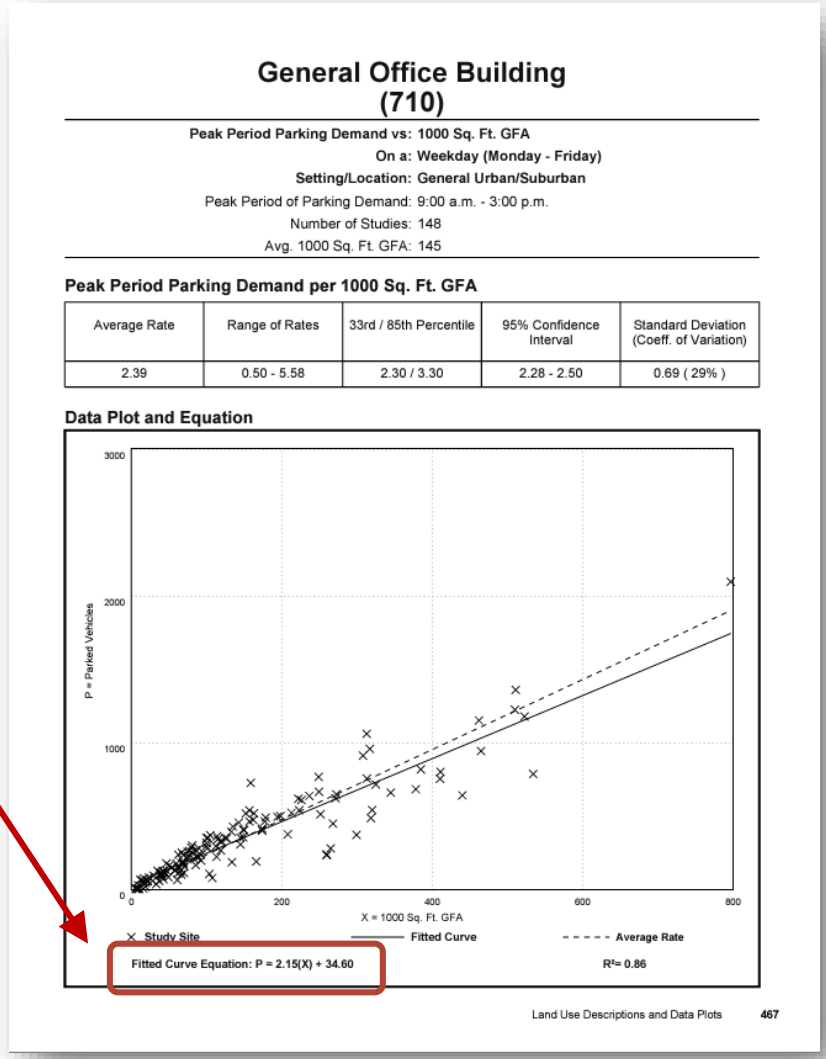
Data Plot and Equation

Land Use Descriptions and Data Plots 467

City of Dallas

Parking Generation Manual

- Consists of:
  - Land Use
  - Variables
  - Statistics
  - Plot
  - Fitted curve equation



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Data Plot and Equation

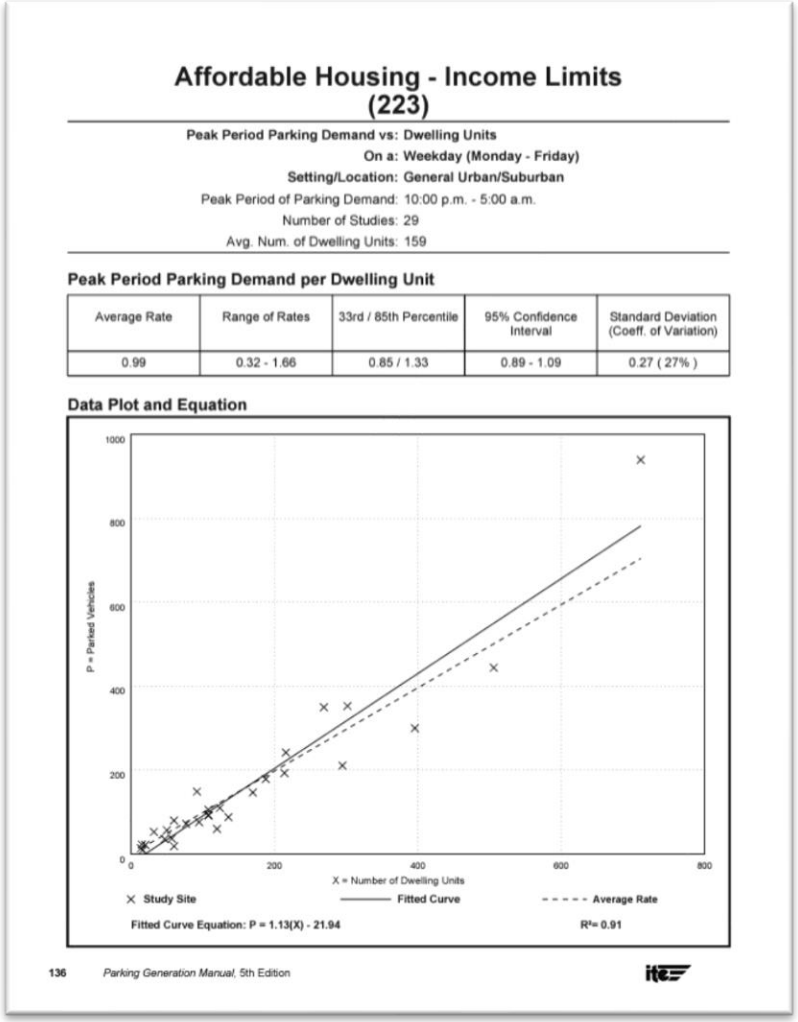
City of Dallas

Parking Generation Manual

- Affordable Housing
  - Avg rate: 0.99 /DU
  - Range: 0.32-1.66 /DU
  - City of Dallas Off-Street Parking Requirement:

    AFFORDABLE HOUSING:

    1.25 space per DU



Affordable Housing - Income Limits (223)

Peak Period Parking Demand vs: Dwelling Units
On a: Weekday (Monday - Friday)
Setting/Location: General Urban/Suburban
Peak Period of Parking Demand: 10:00 p.m. - 5:00 a.m.
Number of Studies: 29
Avg. Num. of Dwelling Units: 159

Peak Period Parking Demand per Dwelling Unit

Average Rate	Range of Rates	33rd / 85th Percentile	95% Confidence Interval	Standard Deviation (Coeff. of Variation)
0.99	0.32 - 1.66	0.85 / 1.33	0.89 - 1.09	0.27 (27%)

Data Plot and Equation

Fitted Curve Equation: P = 1.13(X) - 21.94
R^2= 0.91

136 *Parking Generation Manual*, 5th Edition

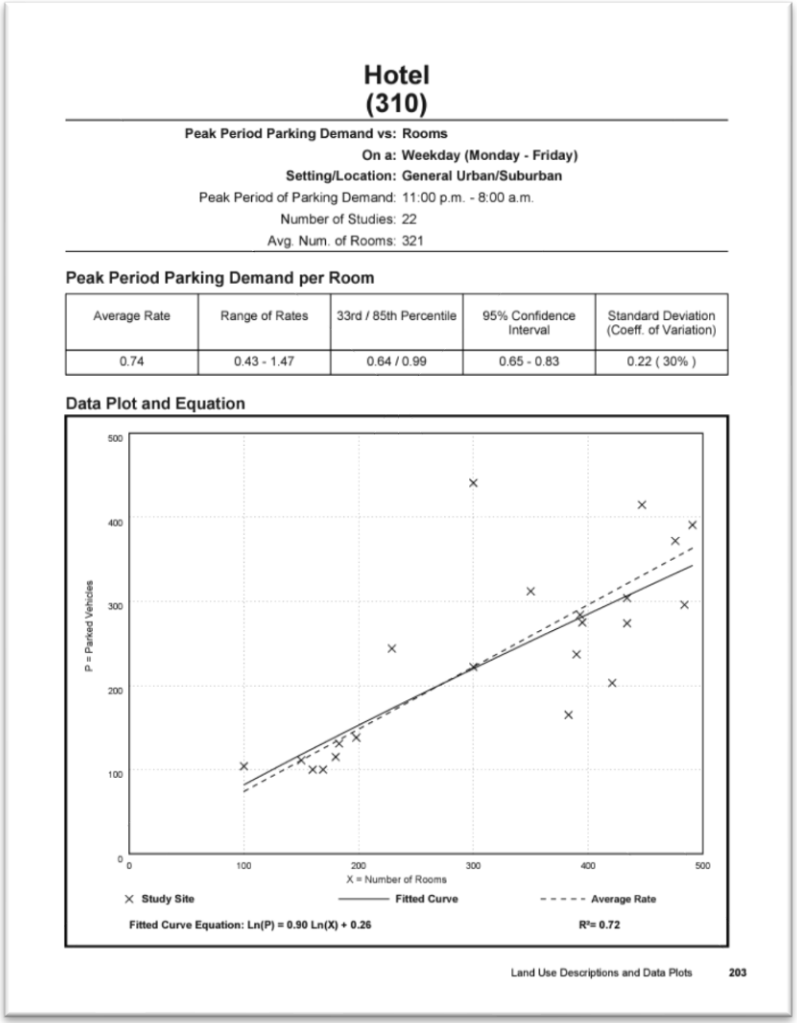
City of Dallas

Parking Generation Manual

- Hotel
  - Avg rate: 0.74 /ROOMS
  - Range: 0.43-1.47 /ROOMS
  - Related land uses:

    All Suites Hotel, Business Hotel, Resort Hotel, Motel
  - City of Dallas Off-Street Parking Requirement:

    HOTEL: 1 space per room



Hotel
(310)

Peak Period Parking Demand vs: Rooms
On a: Weekday (Monday - Friday)
Setting/Location: General Urban/Suburban
Peak Period of Parking Demand: 11:00 p.m. - 8:00 a.m.
Number of Studies: 22
Avg. Num. of Rooms: 321

Peak Period Parking Demand per Room

Average Rate	Range of Rates	33rd / 85th Percentile	95% Confidence Interval	Standard Deviation (Coeff. of Variation)
0.74	0.43 - 1.47	0.64 / 0.99	0.65 - 0.83	0.22 (30%)

Data Plot and Equation

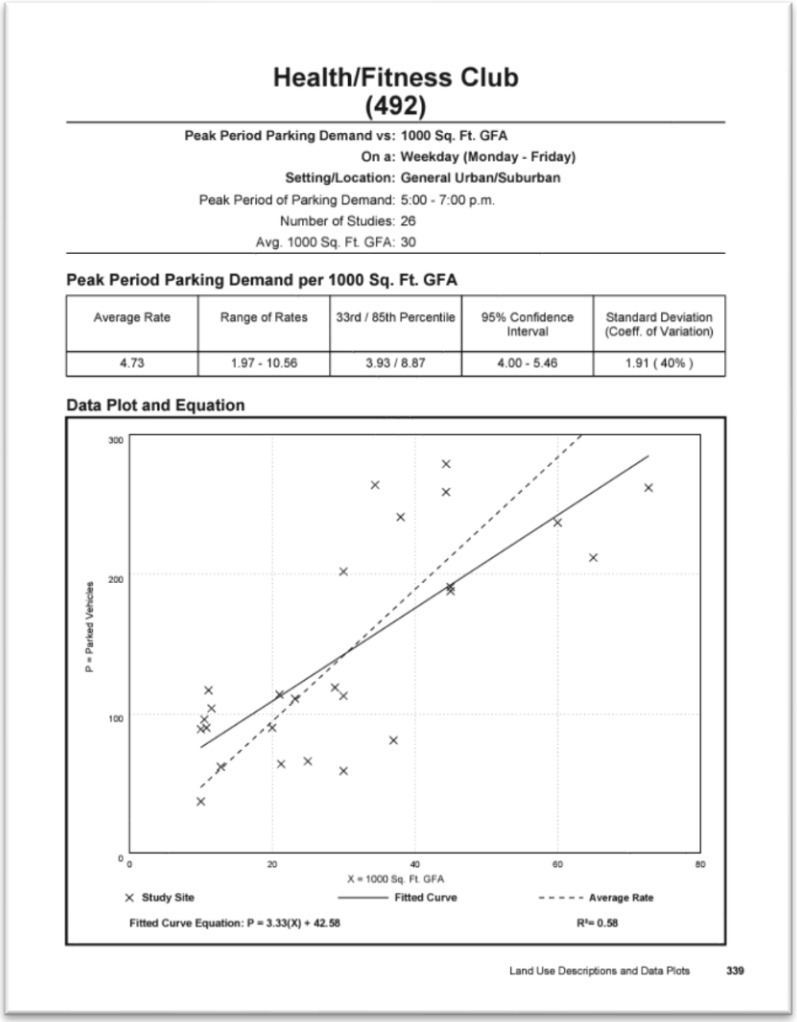
City of Dallas

Parking Generation Manual

- Health/Fitness Club

  - Avg rate: 4.73 /kSF
    (or one per 211 SF)
  - Range: 1.97-10.56 /kSF
    (or one per 95 - 500 SF)

  - City of Dallas Off-Street Parking Requirement:
    PERSONAL SERVICE:
    1 space per 200 SF



Health/Fitness Club
(492)

Peak Period Parking Demand vs: 1000 Sq. Ft. GFA
On a: Weekday (Monday - Friday)
Setting/Location: General Urban/Suburban
Peak Period of Parking Demand: 5:00 - 7:00 p.m.
Number of Studies: 26
Avg. 1000 Sq. Ft. GFA: 30

Peak Period Parking Demand per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	33rd / 85th Percentile	95% Confidence Interval	Standard Deviation (Coeff. of Variation)
4.73	1.97 - 10.56	3.93 / 8.87	4.00 - 5.46	1.91 (40%)

Data Plot and Equation

Parking Generation Manual

- General Office

  (General Urban/Suburban)

  - Avg rate: 2.39 /kSF

    (or one per 418 SF)

  - Range: 0.50-5.58 /kSF

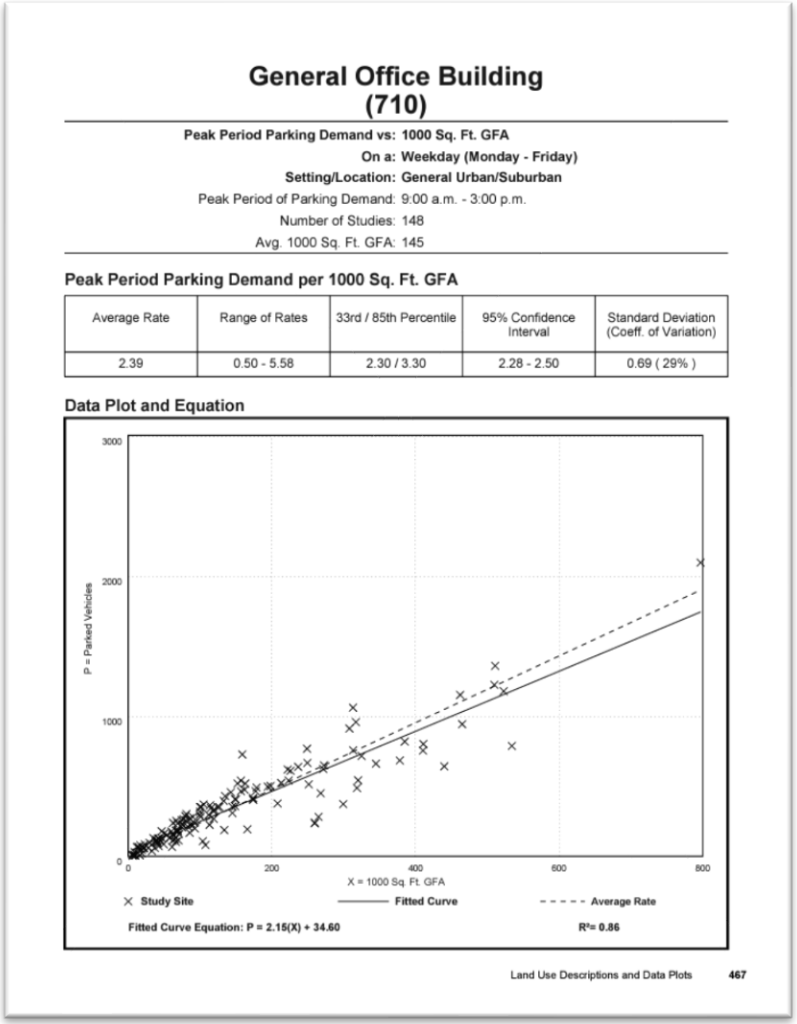
    (or one per 180 – 2,000 SF)

  - Related land uses:

    Small Office, Corporate headquarters, Single Tenant

  - City of Dallas Off-Street Parking Requirement:

    OFFICE: 1 space per 333 SF



General Office Building
(710)

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2.39	0.50 - 5.58	2.30 / 3.30	2.28 - 2.50	0.69 (29%)

Data Plot and Equation

Fitted Curve Equation: P = 2.15(X) + 34.60
R^2= 0.86

Land Use Descriptions and Data Plots 467

City of Dallas

Parking Generation Manual

- General Office

  (Dense Multi-Use Urban)

  - Avg rate: 1.63 /kSF

    (or one per 613 SF)

  - Range: 0.97-2.33 /kSF

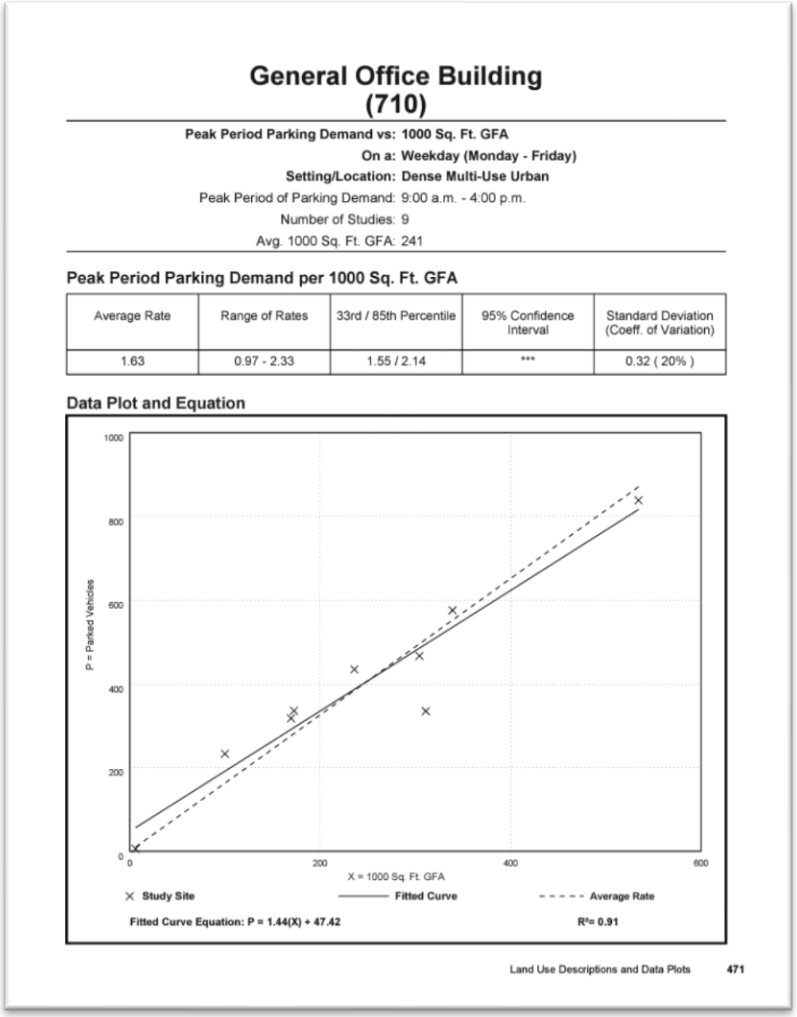
    (or one per 430 – 1,030 SF)

  - Related land uses:

    Small Office, Corporate headquarters, Single Tenant

  - City of Dallas Off-Street Parking Requirement:

    OFFICE: 1 space per 333 SF



General Office Building
(710)

Peak Period Parking Demand vs: 1000 Sq. Ft. GFA
On a: Weekday (Monday - Friday)
Setting/Location: Dense Multi-Use Urban
Peak Period of Parking Demand: 9:00 a.m. - 4:00 p.m.
Number of Studies: 9
Avg. 1000 Sq. Ft. GFA: 241

Peak Period Parking Demand per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	33rd / 85th Percentile	95% Confidence Interval	Standard Deviation (Coeff. of Variation)
1.63	0.97 - 2.33	1.55 / 2.14	***	0.32 (20%)

Data Plot and Equation

Fitted Curve Equation: P = 1.44(X) + 47.42
R^2= 0.91

Land Use Descriptions and Data Plots 471

City of Dallas

Parking Generation Manual

Warnings:

- The manual is based on data from single-use sites with ample free parking and limited transportation alternatives
- While a single-use approach prevents spillover parking, it often means that a large supply sits vacant outside of peak hours
- Parking requirements established solely through use of this publication may not be appropriate in denser urban environment
- Most of the data are derived from suburban developments with limited transit ridership

Parking Generation Manual

Warnings:

- While the manual is not an authoritative standard, it does contain the best available parking demand data.
- The manual does not provide parking supply standards or recommendations on preferred application of data.
- Quality and quantity of data vary significantly by land use; site-specific conditions influence parking demand. Therefore, field surveys of comparable local conditions should be considered to estimate parking demand.

Shared Parking

1983

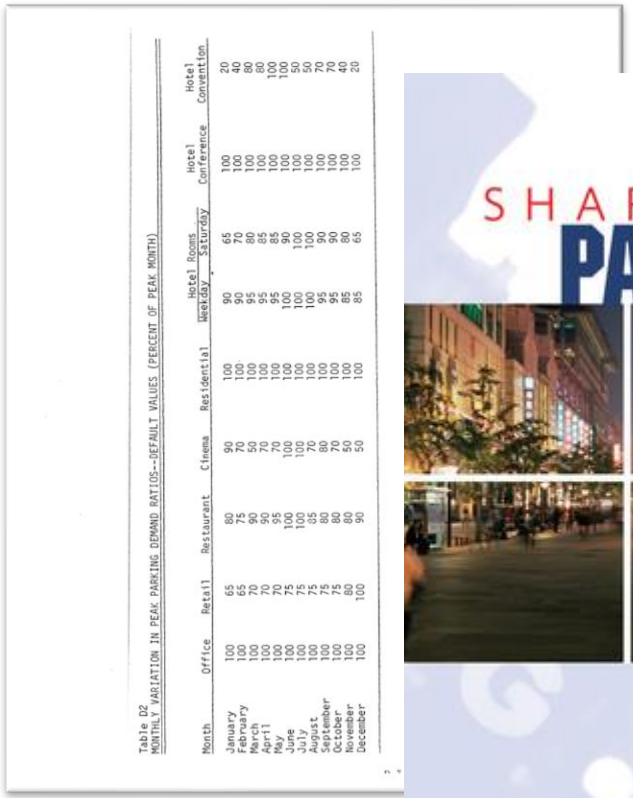
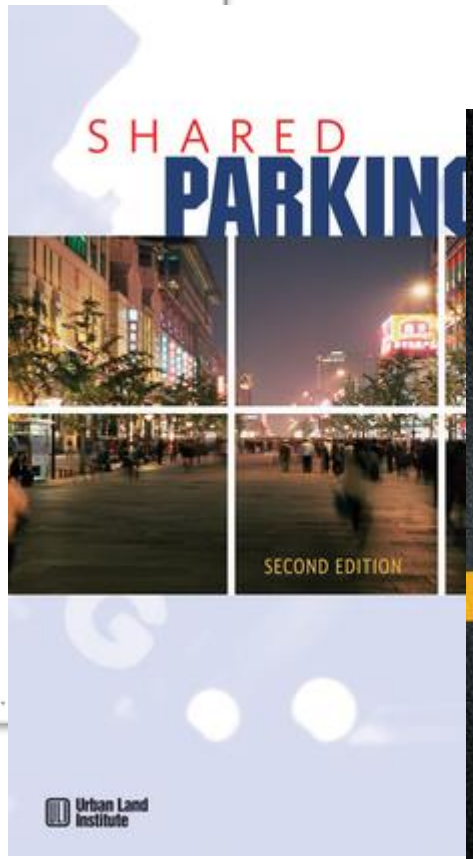


Table D2
MONTHLY VARIATION IN PEAK PARKING DEMAND RATIOS--DEFAULT VALUES (PERCENT OF PEAK MONTH)

Month	Office	Retail	Restaurant	Cinema	Residential	Hotel Rooms Weekday	Hotel Rooms Saturday/	Hotel Conference	Hotel Convention
January	100	65	80	90	100	90	65	100	20
February	100	65	75	70	100	90	70	100	40
March	100	70	90	50	100	95	80	100	80
April	100	70	90	70	100	95	85	100	80
May	100	70	95	70	100	95	85	100	100
June	100	75	100	100	100	100	90	100	100
July	100	75	100	100	100	100	100	100	50
August	100	75	85	70	100	100	100	100	50
September	100	75	80	80	100	95	90	100	70
October	100	80	80	70	100	95	90	100	70
November	100	80	80	50	100	85	80	100	40
December	100	100	90	50	100	85	65	100	20

2004

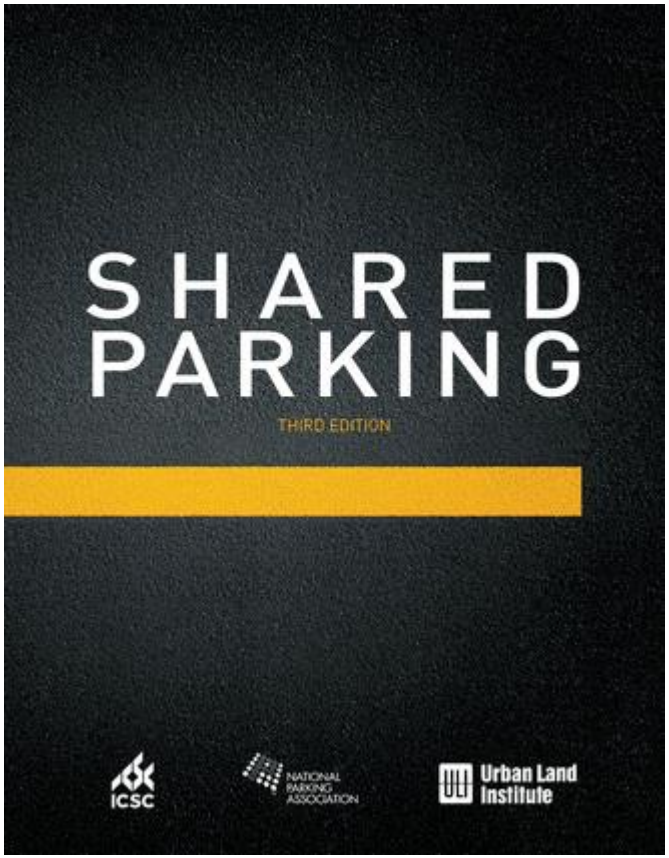


2020

Shared Parking, 3rd edition, Urban Land Institute, 2020

Shared Parking

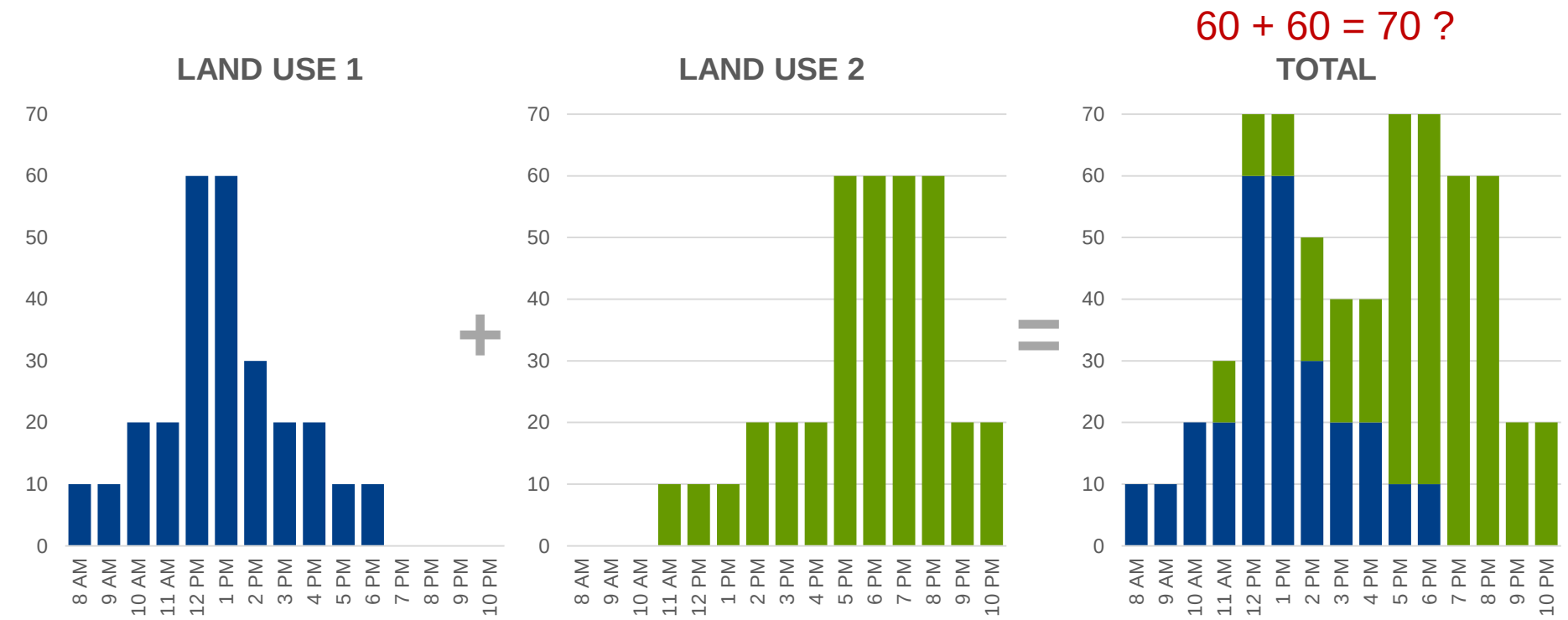
- Published by ULI
- Expands total land uses (from 20 to 32);
- Uses ITE PGM as source for most land uses.
- Provides advice on driving and non-captive adjustments
- Introduces a calculation tool in MS Excel®



Shared Parking

- Shared Parking Methodology

  (from CPC presentation dated April 2019)



City of Dallas

Shared Parking

- Shared Parking Demand Factors
  - Long-term parking demand (e.g., office employees)
  - Short-term parking demand (e.g., patients, visitors)

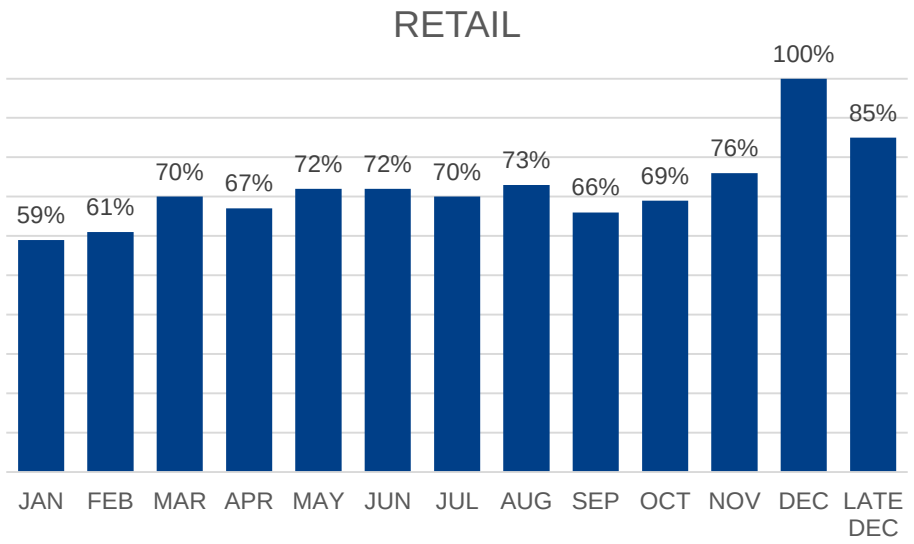
FIGURE 2-4 (continued)

Land Use	User	6 am	7 am	8 am	9 am	10 am	11 am	12 pm	1 pm	2 pm	3 pm	4 pm	5 pm	6 pm	7 pm	8 pm	9 pm	10 pm	11 pm	12 am
Office																				
Office	Visitors	0%	1%	20%	60%	100%	45%	15%	45%	95%	45%	15%	10%	5%	2%	1%	0%	0%	0%	0%
	Employee	3%	15%	50%	90%	100%	100%	85%	85%	95%	95%	85%	60%	25%	15%	5%	3%	1%	0%	0%
	Reserved	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Medical/ dental ofice	Visitors	0%	0%	90%	90%	100%	100%	30%	90%	100%	100%	90%	80%	67%	30%	15%	0%	0%	0%	0%
	Employee	0%	20%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	67%	30%	15%	0%	0%	0%	0%
Bank (drive-in branch)	Visitors	0%	0%	50%	90%	100%	50%	50%	50%	70%	50%	80%	100%	0%	0%	0%	0%	0%	0%	0%
	Employee	0%	0%	60%	100%	100%	100%	100%	100%	50%	80%	100%	100%	0%	0%	0%	0%	0%	0%	0%

Source: excerpt from Shared Parking, 3rd edition, Urban Land Institute, 2020, p. 27

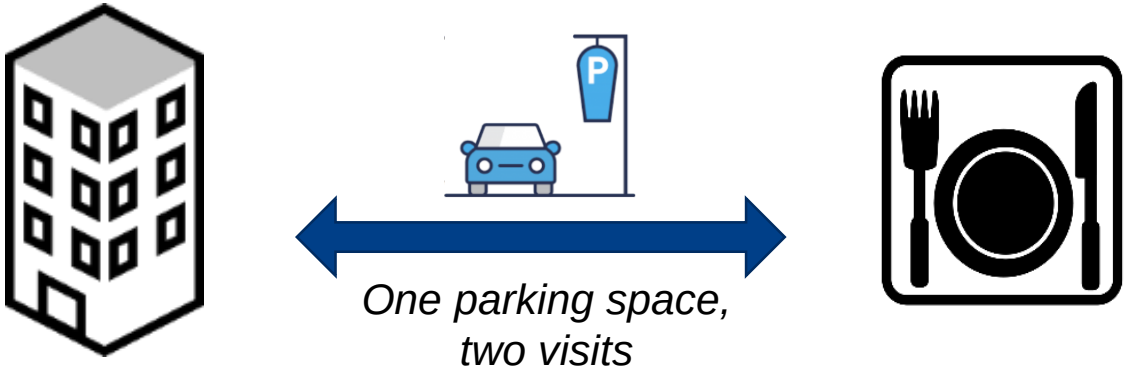
Shared Parking

- Shared Parking Demand Factors
  - Long-term parking demand (e.g., office employees)
  - Short-term parking demand (e.g., patients)
  - Seasonal Factors



Shared Parking

- Shared Parking Demand Factors
  - Long-term parking demand (e.g., office employees)
  - Short-term parking demand (e.g., patients)
  - Seasonal Factors
  - Synergy



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Questions?

David Nevarez, P.E., PTOE

Sustainable Development & Construction

City of Dallas

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