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# Use Cases

for

## ParkMate

**Version 1.0 approved**

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## Revision History

Name	Date	Reason For Changes	Version
Harshil	14/11/2025	-	1.0

# Use Case Descriptions

## I. For Functional Requirement #1

### a. Parking Search & Selection

Use Case ID:	#1-1		
Use Case Name:	Parking Search & Selection		
Created By:	Yibin	Last Updated By:	Harshil
Date Created:	06 Sept 2025	Date Last Updated:	14 Nov 2025

Actor:	Driver(user), Parkmate System, Geocoding API
Description:	Searches for nearby carparks by entering the destination. ParkMate provides geocoding suggestions based on the query, and when a suggestion is selected, the system sets the location as the search destination in Google Maps.
Preconditions:	<ul style="list-style-type: none"> <li>• User account exists (#2-1)</li> <li>• User logged in (#2-2)</li> <li>• Parkmate has access to a geocoding service and a carpark database.</li> </ul>
Postconditions:	<p>Success:</p> <ul style="list-style-type: none"> <li>• Destination is set as the search location and a List of nearby carparks is retrieved and displayed</li> </ul> <p>Failure:</p> <ul style="list-style-type: none"> <li>• No location set</li> </ul>
Priority:	High
Frequency of Use:	High
Flow of Events:	<ol style="list-style-type: none"> <li>1. User navigates to the Search Carpark.</li> <li>2. Parkmate prompts users to input addresses with the “Current Location” option.</li> <li>3. User input address.</li> <li>4. Parkmate retrieves location data from the Geocoding API.</li> <li>5. Parkmate displays a list of location suggestions based on the query.</li> <li>6. User selects a location from the list.</li> <li>7. Parkmate sets selection as search destination in google maps.</li> </ol>
Alternative Flows:	<p>No location suggestions</p> <ol style="list-style-type: none"> <li>1. Display message: No matching locations found.</li> <li>2. Return to Step 2.</li> </ol>
Exceptions:	<p>EX-01: Geocoding API unavailable</p> <ol style="list-style-type: none"> <li>1. Parkmate is unable to connect to API.</li> </ol>

	<ul style="list-style-type: none"><li>2. Display message: "Unable to retrieve location data. Please try again later."</li></ul> <p>EX-02: Invalid address format</p> <ul style="list-style-type: none"><li>1. User enters gibberish, special characters, or unsupported language.</li><li>2. Display message: "Invalid input. Please enter a valid address."</li></ul> <p>EX-03: Carpark database not reachable</p> <ul style="list-style-type: none"><li>1. Parkmate cannot connect to the backend database storing the carpark information.</li></ul>
Includes:	None
Special Requirements:	None
Assumptions:	None
Notes and Issues:	None

### b. Display Nearby Carparks

Use Case ID:	#1-2		
Use Case Name:	Display Nearby Carparks		
Created By:	Yibin	Last Updated By:	Harshil
Date Created:	06 Sept 2025	Date Last Updated:	14 Nov 2025

Actor:	Driver(user), Parkmate System
Description:	ParkMate displays nearby carparks around the selected destination. The user can toggle between map view and list view.
Preconditions:	<ul style="list-style-type: none"> <li>• Destination selected (#1-1)</li> <li>• Parkmate has access to the carpark data</li> </ul>
Postconditions:	<p>Success:</p> <ul style="list-style-type: none"> <li>• Parkmate displays nearby carparks</li> </ul> <p>Failure:</p> <ul style="list-style-type: none"> <li>• No carpark display</li> </ul>
Priority:	High
Frequency of Use:	High
Flow of Events:	<ol style="list-style-type: none"> <li>1. Parkmate displays a toggle for user to choose list or map based view while showing map view on default</li> <li>2. Parkmate displays markers on the map, each representing a carpark</li> <li>3. User selects a marker.</li> <li>4. The selected carpark will be saved to history.</li> <li>5. Each carpark shows (map view) the following details (#1-8):           <ul style="list-style-type: none"> <li>- Name</li> <li>- Distance</li> <li>- Live availability of carpark slots</li> <li>- Price</li> <li>- Height limit</li> <li>- Last updated time</li> </ul> </li> </ol>
Alternative Flows:	<p>List view</p> <ol style="list-style-type: none"> <li>1. Displays each carpark as a list with the same details as Step 5.</li> <li>2. Clicking on any list will be saved to history.</li> </ol>
Exceptions:	<p>EX-01: Carpark data service unavailable</p> <ol style="list-style-type: none"> <li>1. Parkmate cannot fetch carpark details due to database outage.</li> <li>2. Display: "Carpark information unavailable. Please try again"</li> </ol>

	later” EX-02: Map Rendering Failure 1. Map view cannot load 2. Default list view with available carparks
Includes:	#1-1 (destination selected), #1-7 (display carpark details)
Special Requirements:	None
Assumptions:	AS-01: User has selected a destination
Notes and Issues:	None

### c. Live Availability

Use Case ID:	#1-3		
Use Case Name:	Live Availability		
Created By:	Yibin	Last Updated By:	Harshil
Date Created:	06 Sept 2025	Date Last Updated:	14 Nov 2025

Actor:	Driver(user), Parkmate System, Carpark API
Description:	ParkMate fetches and refreshes live carpark availability data at fixed intervals so users see up-to-date information; when data is outdated, the system flags it accordingly.
Preconditions:	<ul style="list-style-type: none"> <li>Nearby carparks displayed(#1-2)</li> </ul>
Postconditions:	<p>Success:</p> <ul style="list-style-type: none"> <li>Displays updated availability for all visible carparks</li> </ul> <p>Failure:</p> <ul style="list-style-type: none"> <li>Shows the timestamp of the last updated information</li> </ul>
Priority:	High
Frequency of Use:	High
Flow of Events:	<ol style="list-style-type: none"> <li>Parkmate fetch availability from Carpark API for all visible carparks</li> <li>Parkmate displays the latest updated availability</li> </ol>
Alternative Flows:	<p>Unable to fetch availability</p> <ol style="list-style-type: none"> <li>Display last updated availability (cached), marked with its timestamp.</li> </ol>
Exceptions:	<p>EX-01: Carpark API unavailable</p> <ol style="list-style-type: none"> <li>Parkmate cannot connect to Carpark API</li> <li>Display: "Live availability temporarily unavailable." and shows last known data with a timestamp.</li> </ol> <p>EX-02: API rate limit exceeded</p> <ol style="list-style-type: none"> <li>Too many requests within a short period, API rejects calls.</li> <li>Parkmate pauses auto-refresh and displays: "Service busy. Retrying shortly."</li> </ol> <p>EX-03: Timeout on data fetch</p> <ol style="list-style-type: none"> <li>API does not response within timeframe</li> <li>Parkmate shows last availability, display: "Data not refreshed."</li> </ol>
Includes:	#1-2 (carparks displayed)
Special	Auto-refresh every 60s (subject to API constraints)

Requirements:	
Assumptions:	AS-1: User logged in (#2-2) AS-2: User selected a destination (#1-1)
Notes and Issues:	None

#### d. Filter Carparks

Use Case ID:	#1-4		
Use Case Name:	Filter Carparks		
Created By:	Yibin	Last Updated By:	Harshil
Date Created:	06 Sept 2025	Date Last Updated:	14 Nov 2025

Actor:	Driver(user), Parkmate System
Description:	Users can toggle filters to show only the relevant carpark markers/results.
Preconditions:	<ul style="list-style-type: none"> <li>Nearby carparks are displayed (#1-2).</li> </ul>
Postconditions:	<p>Success:</p> <ul style="list-style-type: none"> <li>Filtered results are displayed instantly on both map view and list view</li> </ul> <p>Failure:</p> <ul style="list-style-type: none"> <li>Filters are not applied; the previous (unfiltered or last-known) results remain visible, and ParkMate shows an error/timeout message.</li> </ul>
Priority:	Medium
Frequency of Use:	High
Flow of Events:	<ol style="list-style-type: none"> <li>User opens the filter interface.</li> <li>Parkmate displays available filters.</li> <li>User chooses one or more filter options.</li> <li>ParkMate applies the selected filters and updates the current view (map/list) immediately.</li> </ol>
Alternative Flows:	<p>User reset filter</p> <ol style="list-style-type: none"> <li>User click on reset button</li> <li>Clear all filter selected</li> <li>Parkmate displays non-filtered results. (#1-2)</li> </ol> <p>No matching filters for carpark</p> <ol style="list-style-type: none"> <li>Users filter options unable to display a matching carpark</li> <li>Prompts "No carparks matched"</li> <li>Goes to Step 1</li> </ol>
Exceptions:	<p>EX-01: Filter data missing</p> <ol style="list-style-type: none"> <li>Carpark database has missing or inconsistent data for a chosen filter.</li> <li>Parkmate shows partial data, display message: Some carparks may have missing information.</li> </ol>

Includes:	#1-1 (destination selected), #1-2 (carparks displayed)
Special Requirements:	None
Assumptions:	AS-1: User logged in (#2-2) AS-2: User selected a destination (#1-1)
Notes and Issues:	None

## 1. Filter Height

Use Case ID:	#1-4-1-1		
Use Case Name:	Filter Height		
Created By:	Yibin	Last Updated By:	Harshil
Date Created:	08 Sept 2025	Date Last Updated:	14 Nov 2025

Actor:	Driver(user), Parkmate System
Description:	Users can enable or disable height filters
Preconditions:	<ul style="list-style-type: none"> <li>Nearby carparks are displayed (#1-2).</li> </ul>
Postconditions:	<p>Success:</p> <ul style="list-style-type: none"> <li>Filtered results are displayed instantly on both map view and list view</li> </ul> <p>Failure:</p> <ul style="list-style-type: none"> <li>Filters are not applied; the previous results remain visible, and ParkMate shows “Filtering failed/timed out, showing previous results.”</li> </ul>
Priority:	Medium
Frequency of Use:	High
Flow of Events:	<ol style="list-style-type: none"> <li>User clicks on “height” filter button</li> <li>Parkmate updates the result on the map view</li> </ol>
Alternative Flows:	<p>AF-S1: Reset</p> <ol style="list-style-type: none"> <li>User taps Reset/Clear → all height filters cleared</li> <li>ParkMate shows unfiltered results (#1-2).</li> </ol> <p>AF-S2: No matches</p> <ol style="list-style-type: none"> <li>Zero results</li> <li>ParkMate shows “No carparks match this height” with “Relax filter” action.</li> </ol>
Exceptions:	<p>EX-01: Height data missing</p> <ol style="list-style-type: none"> <li>Some carparks do not have height limit informations</li> <li>Parkmate display with message: Height data unavailable</li> </ol> <p>EX-02: Timeout on filter execution</p> <ol style="list-style-type: none"> <li>Filtering takes too long &gt;5 minutes</li> <li>Displays: Filtering timed out, displaying previous results.</li> </ol>
Includes:	#1-1 (destination selected), #1-2 (carparks displayed)
Special Requirements:	Units are meters (m).

Assumptions:	AS-1: User logged in (#2-2) AS-2: User selected a destination (#1-1) AS-3: User on filter interface(#1-4 Step 2)
Notes and Issues:	None

## 2. Filter Sheltered Parking

Use Case ID:	#1-4-1-2		
Use Case Name:	Filter Sheltered Parking		
Created By:	Yibin	Last Updated By:	Harshil
Date Created:	08 Sept 2025	Date Last Updated:	14 Nov 2025

Actor:	Driver(user), Parkmate System
Description:	Users can enable or disable “Sheltered Parking” filters
Preconditions:	<ul style="list-style-type: none"> <li>Nearby carparks are displayed (#1-2).</li> </ul>
Postconditions:	<p>Success:</p> <ul style="list-style-type: none"> <li>Filtered results are displayed instantly on map view.</li> </ul> <p>Failure:</p> <ul style="list-style-type: none"> <li>Filters are not applied; the previous results remain visible, and ParkMate shows: “Filtering failed/timed out, showing previous results.”</li> </ul>
Priority:	Medium
Frequency of Use:	High
Flow of Events:	<ol style="list-style-type: none"> <li>User clicks on “Sheltered Parking” filter button</li> <li>Parkmate updates the result on the map view.</li> </ol>
Alternative Flows:	<p>Reset Filters</p> <ol style="list-style-type: none"> <li>User clears filters</li> <li>ParkMate removes the sheltered constraint and shows unfiltered results (#1-2)</li> </ol> <p>No matching filters for carpark</p> <ol style="list-style-type: none"> <li>Users filter options unable to display a matching carpark</li> <li>Prompts (“No carparks matched”)</li> <li>Goes to #1-4 Step 2 (choosing filter)</li> </ol>
Exceptions:	<p>EX-01: Shelter information missing</p> <ol style="list-style-type: none"> <li>Some carparks do not have shelter information</li> <li>Parkmates display: shelter information unavailable.</li> </ol> <p>EX-02: Timeout on filter execution</p> <ol style="list-style-type: none"> <li>Filtering takes too long &gt;5 minutes</li> <li>Displays: Fltlering timed out, displaying previous results.</li> </ol>
Includes:	#1-1 (destination selected), #1-2 (carparks displayed)
Special Requirements:	None

Assumptions:	AS-1: User logged in (#2-2) AS-2: User selected a destination (#1-1) AS-3: User on filter interface(#1-4 Step 2)
Notes and Issues:	None

## 3. Filter Operating Hours

Use Case ID:	#1-4-1-3		
Use Case Name:	Filter Operating Hours		
Created By:	Yibin	Last Updated By:	Harshil
Date Created:	08 Sept 2025	Date Last Updated:	14 Nov 2025

Actor:	Driver(user), Parkmate System
Description:	Users can modify Operating Hours filters
Preconditions:	<ul style="list-style-type: none"> <li>Nearby carparks are displayed (#1-2).</li> </ul>
Postconditions:	<p>Success:</p> <ul style="list-style-type: none"> <li>Filtered results are displayed instantly on the map view.</li> </ul> <p>Failure:</p> <ul style="list-style-type: none"> <li>Filters are not applied; the previous results remain visible, and ParkMate shows: “Filtering failed/timed out, showing previous results.”</li> </ul>
Priority:	Medium
Frequency of Use:	High
Flow of Events:	<ol style="list-style-type: none"> <li>User clicks on “Overnight / all / Non Overnight” filter button</li> <li>Parkmate updates the result on the current view map</li> </ol>
Alternative Flows:	<p>No matching filters for carpark</p> <ol style="list-style-type: none"> <li>Users filter options unable to display a matching carpark</li> <li>Prompts (“No carparks matched”)</li> <li>Goes to #1-4 Step 2 (choosing filter)</li> </ol>
Exceptions:	<p>EX-01: Operating Hours information missing</p> <ol style="list-style-type: none"> <li>Some carparks do not have operating hours information</li> <li>Parkmate display: Operating Hours information unavailable.</li> </ol> <p>EX-02: Timeout on filter execution</p> <ol style="list-style-type: none"> <li>Filtering takes too long &gt;5 minutes</li> <li>Displays: Filtering timed out, displaying previous results</li> </ol>
Includes:	#1-1 (destination selected), #1-2 (carparks displayed)
Special Requirements:	None
Assumptions:	<p>AS-1: User logged in (#2-2)</p> <p>AS-2: User selected a destination (#1-1)</p> <p>AS-3: User on filter interface(#1-4 Step 2)</p>

Notes and Issues:	None
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### e. Sort Carparks

Use Case ID:	#1-5		
Use Case Name:	Sort Carparks		
Created By:	Yibin	Last Updated By:	Harshil
Date Created:	06 Sept 2025	Date Last Updated:	14 Nov 2025

Actor:	Driver(user), Parkmate System, Carpark API
Description:	User sorts the currently displayed carparks by a chosen criterion (Distance, Price, Availability) and order.
Preconditions:	<ul style="list-style-type: none"> <li>Nearby carparks displayed (#1-2)</li> </ul>
Postconditions:	<p>Success:</p> <ul style="list-style-type: none"> <li>Carparks sorted based on criteria</li> </ul> <p>Failure:</p> <ul style="list-style-type: none"> <li>Sorting is not applied; the previous order remains, and ParkMate shows: “Sorting failed/timed out—showing previous order.”</li> </ul>
Priority:	Medium
Frequency of Use:	High
Flow of Events:	<ol style="list-style-type: none"> <li>Parkmate displays sorting options (Availability, Price, Distance)</li> <li>User selects a sorting criteria</li> <li>Parkmate reorders the result on current view (map)</li> </ol>
Alternative Flows:	<p>Resets to default</p> <ol style="list-style-type: none"> <li>User taps Reset</li> <li>ParkMate restores default order and removes the sort</li> </ol>
Exceptions:	<p>EX-01: Missing data for sorting criteria</p> <ol style="list-style-type: none"> <li>Some carparks do not have values for chosen criteria (e.g. missing prices, no availability data)</li> <li>Parkmate places them at bottom, displays: Data unavailable</li> </ol> <p>EX-02: Sorting Logic Failure</p> <ol style="list-style-type: none"> <li>Internal error when reordering results (e.g. null values or calculation errors)</li> <li>Parkmate displays previous unsorted results with message: Sorting failed, showing default values.</li> </ol>
Includes:	#1-2 (carparks displayed)
Special	None

Requirements:	
Assumptions:	AS-1: User logged in (#2-2) AS-2: User selected a destination (#1-1)
Notes and Issues:	None

### f. Parking Cost Details

Use Case ID:	#1-6		
Use Case Name:	Display Parking Cost		
Created By:	Yibin	Last Updated By:	Harshil
Date Created:	06 Sept 2025	Date Last Updated:	15 Nov 2025

Actor:	Driver(user), Parkmate System, Carpark API
Description:	<p>This use case allows the user to view the official parking cost information for a selected carpark.</p> <p>When the user opens a carpark's details page, ParkMate retrieves the relevant tariff rules (base rate, hourly rate, peak/off-peak fees, and EV charging fees if applicable) and displays them clearly in the UI.</p> <p>This feature provides transparency and helps users make informed decisions before selecting a parking location.</p>
Preconditions:	<ul style="list-style-type: none"> <li>• User has selected a destination (#1-1)</li> <li>• Nearby carparks displayed (#1-2)</li> <li>• Tariff data must exist in the ParkMate carpark database (unless unavailable).</li> </ul>
Postconditions:	<p>Success:</p> <ul style="list-style-type: none"> <li>• Parking cost information is displayed to the user.</li> </ul> <p>Failure:</p> <ul style="list-style-type: none"> <li>• Parkmate displays "Parking details unavailable."</li> </ul>
Priority:	Medium
Frequency of Use:	Medium
Flow of Events:	<ol style="list-style-type: none"> <li>1. The user selects a carpark from the list or map.</li> <li>2. The system loads the carpark details page.</li> <li>3. The system retrieves tariff rules from the database.</li> <li>4. The system displays the parking cost information, including relevant rates and fees.</li> </ol>
Alternative Flows:	None
Exceptions:	<p>EX-01: Database retrieval error</p> <ol style="list-style-type: none"> <li>1. Unable to retrieve information from database or database network failure</li> </ol> <p>EX-02: Carpark Tariff data missing</p> <ol style="list-style-type: none"> <li>1. Carpark API does not return tariff rules, or rules are incomplete (e.g. weekend rates missing)</li> <li>2. Display: "Pricing details unavailable."</li> </ol>

	<p>EX-03: API timeout</p> <ol style="list-style-type: none"><li>1. Parkmate cannot fetch information due to slow response or API downtime.</li><li>2. Display: “Unable to retrieve information. Please try again later.”</li></ol>
Includes:	#1-2 (carparks displayed)
Special Requirements:	None
Assumptions:	AS-1: User logged in (#2-2) AS-2: User selected a destination (#1-1)
Notes and Issues:	None

### g. Carpark Details

Use Case ID:	#1-7		
Use Case Name:	Carpark Details		
Created By:	Yibin	Last Updated By:	Harshil
Date Created:	06 Sept 2025	Date Last Updated:	15 Nov 2025

Actor:	Driver(user), Parkmate System, Carpark API
Description:	Displays detailed information for a selected carpark, including pricing, lot availability, price, height limits, and operating hours.
Preconditions:	<ul style="list-style-type: none"> <li>User has selected a carpark</li> </ul>
Postconditions:	<p>Success:</p> <ul style="list-style-type: none"> <li>Parkmate displays complete carpark information</li> </ul> <p>Failure:</p> <ul style="list-style-type: none"> <li>Data retrieval fails, shows warning message</li> </ul>
Priority:	High
Frequency of Use:	High
Flow of Events:	<ol style="list-style-type: none"> <li>Parkmate retrieves carpark details from Carpark API</li> <li>Parkmate displays carpark details:             <ul style="list-style-type: none"> <li>Name</li> <li>Distance</li> <li>Live availability of carpark slots</li> <li>Price</li> <li>Carpark type</li> <li>Height limit</li> </ul> </li> </ol>
Alternative Flows:	<p>Retrieval Failure:</p> <ol style="list-style-type: none"> <li>Shows warning message "Failed to retrieve data."</li> </ol> <p>Partial Failure:</p> <ol style="list-style-type: none"> <li>Some sections are missing from the source</li> <li>Renders available sections; for each missing section, shows "Not provided by operator"</li> </ol>
Exceptions:	<p>EX-01: API timeout</p> <ol style="list-style-type: none"> <li>Parkmate cannot fetch information due to slow response or API downtime.</li> <li>Display: "Unable to retrieve information. Please try again later."</li> </ol> <p>EX-02: Network Timeout / Connectivity Loss</p> <ol style="list-style-type: none"> <li>Request to Carpark API takes too long or fails due to poor internet.</li> </ol>

	2. Show cached details (if available) 3. Message: "Offline, showing cached data (if available)."
Includes:	#1-2 (carparks displayed)
Special Requirements:	None
Assumptions:	AS-1: User logged in (#2-2) AS-2: User selected a destination (#1-1)
Notes and Issues:	None

### **h. Add Favourites**

Use Case ID:	#1-8		
Use Case Name:	Add Favourites		
Created By:	Yibin	Last Updated By:	Harshil
Date Created:	07 Sept 2025	Date Last Updated:	15 Nov 2025

Actor:	Driver(user), Parkmate System
Description:	Allows users to add a carpark to their favourites list by clicking on the heart button in the carpark information window (#1-8)
Preconditions:	<ul style="list-style-type: none"> <li>• Carparks are already displayed(#1-2)</li> </ul>
Postconditions:	<p>Success:</p> <ul style="list-style-type: none"> <li>• Selected carpark is added to favourites</li> </ul> <p>Failure:</p> <ul style="list-style-type: none"> <li>• No change to favourites; icon reverts (if optimistically filled); error banner shown.</li> </ul>
Priority:	High
Frequency of Use:	High
Flow of Events:	<ol style="list-style-type: none"> <li>1. User selects a carpark from the list or mapview.</li> <li>2. User taps the “Favourite” icon.</li> <li>3. ParkMate marks the carpark as favourited.</li> <li>4. Carpark is stored in the user’s Favourites list.</li> <li>5. ParkMate updates the UI with a filled favourite icon.</li> </ol>
Alternative Flows:	<p>Already Favoured:</p> <ol style="list-style-type: none"> <li>1. Server returns 409 Conflict (or client detects duplicate)..</li> <li>2. System keeps state unchanged; shows non-blocking toast: “Already in Favourites.”</li> </ol>
Exceptions:	<p>EX-01: Database/Storage Failure</p> <ol style="list-style-type: none"> <li>1. ParkMate cannot write to the database or local storage (e.g., storage full, server error)</li> <li>2. Display message: “Unable to add to favourites. Please try again later.”</li> </ol> <p>EX-02: Invalid Carpark ID</p> <ol style="list-style-type: none"> <li>1. Selected carpark references are missing, expired, or corrupted in the database.</li> <li>2. Prevent add action; show: “Carpark not found. Cannot add to favourites.”</li> </ol> <p>EX-03: Network/Connectivity Loss</p> <ol style="list-style-type: none"> <li>1. Action requires server confirmation but network is down</li> <li>2. Message: “No internet connection. Please try again later.”</li> </ol>

Includes:	#1-2 (carpark displayed)
Special Requirements:	None
Assumptions:	AS-1: User already logged in. (#2-2) AS-2: User already entered a destination. (#1-1)
Notes and Issues:	None

## II. For Functional Requirement #2

### a. Create Account

Use Case ID:	#2-1		
Use Case Name:	Create Account		
Created By:	Abdillah	Last Updated By:	Preetham
Date Created:	08 Sept 2025	Date Last Updated:	14 Nov 2025

Actor:	Driver (User), ParkMate System
Description:	User creates a ParkMate account using email and password, with validation and duplicate account checks.
Preconditions:	<ul style="list-style-type: none"> <li>• User does not already have an account with that email.</li> <li>• Internet connection is available.</li> </ul>
Postconditions:	<ul style="list-style-type: none"> <li>• Success: New account created, user directed to login page.</li> <li>• Failure: No account created, error message shown.</li> </ul>
Priority:	High
Frequency of Use:	Low
Flow of Events:	<ol style="list-style-type: none"> <li>1. User selects “Sign Up”</li> <li>2. User enters email &amp; password.             <ol style="list-style-type: none"> <li>a. System validates email format</li> <li>b. System checks for password requirement (ideally more than 12 characters, and use a combination of uppercase letters, lowercase letters, numbers, and symbols)</li> </ol> </li> <li>3. If valid -&gt; Account created</li> <li>4. If invalid -&gt; System shows error message</li> <li>5. If email already registered -&gt; System shows “Email already in use”</li> <li>6. If passwords do not match -&gt; System shows “Password do not match”</li> </ol>
Alternative Flows:	Weak password -> “Password must meet the requirements”
Exceptions:	Network/server error -> “Service unavailable”
Includes:	Validation Service
Special Requirements:	Secure password storage (hashed)
Assumptions:	User owns email provided

Notes and Issues:

Login via social may be added later.

**b. Login**

Use Case ID:	#2-2		
Use Case Name:	Login		
Created By:	Abdillah	Last Updated By:	Yibin
Date Created:	08 Sept 2025	Date Last Updated:	14 Nov 2025

Actor:	Driver (User), ParkMate System
Description:	User logs into the system with registered credentials.
Preconditions:	<ul style="list-style-type: none"> <li>User has a registered account.</li> </ul>
Postconditions:	<ul style="list-style-type: none"> <li>On login: User navigates to Home screen.</li> </ul>
Priority:	High
Frequency of Use:	High
Flow of Events:	<ol style="list-style-type: none"> <li>User enters email and password</li> <li>System verifies credentials.</li> <li>If valid -&gt; Navigate to Home screen</li> <li>If invalid -&gt; "Email and password do not match"</li> <li>Logout -&gt; User session cleared, redirected to login screen</li> </ol>
Alternative Flows:	Account not found → "Email not registered."
Exceptions:	Server down → "Unable to connect."
Includes:	nil
Special Requirements:	<ul style="list-style-type: none"> <li>Secure session management.</li> </ul>
Assumptions:	User inputs correct credentials.
Notes and Issues:	nil

### c. Password Reset

Use Case ID:	#2-3		
Use Case Name:	Password Reset		
Created By:	Abdillah	Last Updated By:	Abdillah
Date Created:	08 Sept 2025	Date Last Updated:	14 Nov 2025

Actor:	Driver (User), ParkMate System, Email Service
Description:	User resets forgotten password or changes password after login
Preconditions:	<ul style="list-style-type: none"> <li>• Registered email.</li> <li>• Internet connection.</li> </ul>
Postconditions:	User has new valid password.
Priority:	Medium
Frequency of Use:	Medium
Flow of Events:	<ol style="list-style-type: none"> <li>1. User selects “Forgot Password”</li> <li>2. User has to fill in their registered Email Address.</li> <li>3. System sends reset link to user’s email.</li> <li>4. User clicks reset link in the email and redirected back to ParkMate to set a new password.</li> <li>5. Authenticated Users can also change password after verifying current password</li> </ol>
Alternative Flows:	Unregistered Email → System shows “Unregistered Email. Please enter again.”
Exceptions:	Invalid reset link expired.
Includes:	nil
Special Requirements:	<ul style="list-style-type: none"> <li>• Token expiration for reset link.</li> </ul>
Assumptions:	User can access registered email.
Notes and Issues:	nil

#### d. Delete Account

Use Case ID:	#2-4		
Use Case Name:	Delete Account		
Created By:	Abdillah	Last Updated By:	Preetham
Date Created:	08 Sept 2025	Date Last Updated:	14 Nov 2025

Actor:	Driver (User), ParkMate System
Description:	User deletes account permanently.
Preconditions:	User is logged in.
Postconditions:	Account and preferences removed.
Priority:	Medium
Frequency of Use:	Low
Flow of Events:	<ol style="list-style-type: none"> <li>1. User goes into Settings</li> <li>2. User selects “Delete Account.”</li> <li>3. System prompts confirmation and user has to fill in their password to confirm</li> <li>4. If confirmed -&gt; Account deleted, favourites/preferences erased.</li> </ol>
Alternative Flows:	User fills in the wrong password -> Account is not deleted
Exceptions:	nil
Includes:	nil
Special Requirements:	<ul style="list-style-type: none"> <li>• Irreversible deletion.</li> </ul>
Assumptions:	User intends permanent removal.
Notes and Issues:	nil

### e. View Terms of Service & Privacy Policy

Use Case ID:	#2-5		
Use Case Name:	View Terms of Service and Policy		
Created By:	Abdillah	Last Updated By:	Abdillah
Date Created:	08 Sept 2025	Date Last Updated:	14 Nov 2025

Actor:	Driver (User), ParkMate System
Description:	User views TOS and from Profile page.
Preconditions:	User is logged in.
Postconditions:	Content displayed with date.
Priority:	Low
Frequency of Use:	Medium
Flow of Events:	<ol style="list-style-type: none"> <li>1. User navigates to Settings.</li> <li>2. User selects TOS/Privacy Policy.</li> <li>3. System displays content with version/date</li> </ol>
Alternative Flows:	None
Exceptions:	nil
Includes:	nil
Special Requirements:	<ul style="list-style-type: none"> <li>• Must show latest date updated.</li> </ul>
Assumptions:	TOS content is updated in system backend.
Notes and Issues:	Consider multilingual support.

**f. Log Out**

Use Case ID:	#2-6		
Use Case Name:	Log Out		
Created By:	Yibin	Last Updated By:	Yibin
Date Created:	09 Sept 2025	Date Last Updated:	14 Nov 2025

Actor:	Driver(user), Parkmate System
Description:	Logged-in user logs out of the ParkMate application via the Settings page.
Preconditions:	<ul style="list-style-type: none"> <li>User logged in</li> </ul>
Postconditions:	<p>Success:</p> <ul style="list-style-type: none"> <li>Upon successful logout, the user is redirected to the Login page.</li> </ul>
Priority:	High
Frequency of Use:	Medium
Flow of Events:	<ol style="list-style-type: none"> <li>User taps the “Logout” button.</li> <li>ParkMate invalidates the current user session.</li> <li>ParkMate clears cached data related to the logged-in user.</li> <li>ParkMate redirects the user to the Login page.</li> </ol>
Alternative Flows:	None
Exceptions:	None
Includes:	nil
Special Requirements:	None
Assumptions:	None
Notes and Issues:	None

### III. For Functional Requirement #3

#### a. Handle External API Failure

Use Case ID:	#3-1		
Use Case Name:	Handle External API Failure		
Created By:	Abdillah	Last Updated By:	Harshil
Date Created:	07 Sept 2025	Date Last Updated:	14 Nov 2025

Actor:	Driver (User), ParkMate System, External API
Description:	When live availability data cannot be retrieved due to API issues, ParkMate displays a visible banner and continues showing last-known data.
Preconditions:	<ul style="list-style-type: none"> <li>• User has searched for carparks (#1-1, #1-2).</li> <li>• (If showing cached data) A previous successful live fetch exists and is stored.</li> </ul>
Postconditions:	Success: Banner displayed with timestamp, last-known data shown with "Stale" tag
Priority:	High
Frequency of Use:	High
Flow of Events:	<ol style="list-style-type: none"> <li>1. ParkMate requests live carpark data from API</li> <li>2. API call fails (unreachable or error)</li> <li>3. ParkMate displays banner: "Live data temporarily unavailable - showing last update at HH:MM"</li> <li>4. ParkMate shows cached availability with "Stale" tag</li> <li>5. System retries in background</li> <li>6. If the system successfully calls API, ParkMate refreshes data and removes banner.</li> </ol>
Alternative Flows:	<ol style="list-style-type: none"> <li>1. If the API recovers, ParkMate updates results</li> <li>2. If the API is unavailable for more than 15 minutes, ParkMate displays, "Live data unavailable for extended period, please try again later or check offline options." . Suggests user to retry after some time or contact support if persistent.</li> <li>3. If local cached data is missing or corrupted, ParkMate displays, "Carpark availability information cannot be retrieved. We are working to restore service."</li> </ol>
Exceptions:	If there is a Database/network error when accessing cached data, ParkMate displays, "Carpark availability information cannot be retrieved. We are working to restore service."

Includes:	#1-3 (Live Availability)
Special Requirements:	None
Assumptions:	Internet connection available
Notes and Issues:	none

### b. Location Permission disabled

Use Case ID:	#3-2		
Use Case Name:	Location Permission disabled		
Created By:	Abdillah	Last Updated By:	Harshil
Date Created:	07 Sept 2025	Date Last Updated:	14 Nov 2025

Actor:	Driver (User), ParkMate System, Geocoding api
Description:	If location access is not enabled, ParkMate still allows destination-based search and adjusts distance labels accordingly.
Preconditions:	User had denied location access
Postconditions:	<p>Success:</p> <ul style="list-style-type: none"> <li>• Carparks are displayed relative to chosen destination</li> </ul> <p>Failure:</p> <ul style="list-style-type: none"> <li>• None (search still works)</li> </ul>
Priority:	Medium
Frequency of Use:	Medium
Flow of Events:	<ol style="list-style-type: none"> <li>1. User launches ParkMate and denies location permission when prompted.</li> <li>2. User initiates a search by entering a destination address or postal code.</li> <li>3. ParkMate queries the external API using the provided destination.</li> <li>4. ParkMate calculates distances from the chosen destination to nearby carparks.</li> <li>5. ParkMate displays the carpark list, with distances clearly labeled as “from destination” instead of “from current location.”</li> </ol>
Alternative Flows:	If Geocoding API is unreachable or times out, ParkMate displays, “Location service temporarily unavailable, search results may be incomplete or inaccurate.”
Exceptions:	<p>If Geocoding API returns an error or invalid data, System displays, “Could not process the destination address. Please check the input and try again.”</p> <p>If no network/offline, “You’re offline. Enter a destination when you’re back online.”</p>
Includes:	#1-1 (Search Destination), #1-2 (Display Carparks).

Special Requirements:	None
Assumptions:	User manually inputs destination
Notes and Issues:	None

### c. Display Refresh Loading State

Use Case ID:	#3-3		
Use Case Name:	Display Refresh Loading State		
Created By:	Abdillah	Last Updated By:	Harshil
Date Created:	07 Sept 2025	Date Last Updated:	14 Nov 2025

Actor:	Driver (User), ParkMate System
Description:	When data is being refreshed (manual pull-to-refresh or scheduled auto-refresh), ParkMate shows a non-blocking loading state and then replaces results atomically. If refresh fails, the app keeps previous results and shows an error.
Preconditions:	Carparks displayed (#1-2), A refresh is triggered
Postconditions:	<p>Success:</p> <ul style="list-style-type: none"> <li>User sees updated results after refresh OR error message if refresh fails</li> </ul> <p>Failure:</p> <ul style="list-style-type: none"> <li>Previous results remain visible; a banner/toast shows “Couldn’t refresh” with a Retry action</li> </ul>
Priority:	Medium
Frequency of Use:	High (whenever user refreshes or data auto-updates)
Flow of Events:	<ol style="list-style-type: none"> <li>User initiates refresh (manual or auto)</li> <li>ParkMate displays loading state</li> <li>Once data is retrieved, the loading indicator disappears.</li> <li>Updated results shown to user</li> </ol>
Alternative Flows:	<ol style="list-style-type: none"> <li>If the user switches away during refresh, the loading state is paused and resumes once the app returns to foreground.</li> </ol>
Exceptions:	<p>API failure</p> <ol style="list-style-type: none"> <li>Keep previous data, show banner “Can’t refresh right now” with Retry</li> </ol> <p>Partial Failure</p> <ol style="list-style-type: none"> <li>Update what succeeded; label affected sections “Live data unavailable”; keep prior availability for a short grace window with “Stale” tag</li> </ol>
Includes:	#1-2 Display Carparks, #1-3 Live Availability
Special Requirements:	None

Assumptions:	None
Notes and Issues:	None

## IV. For Functional Requirement #4

### a. Open in Maps

Use Case ID:	#4-1		
Use Case Name:	Open in Maps		
Created By:	Abdillah	Last Updated By:	Preetham
Date Created:	07 Sept 2025	Date Last Updated:	15 Nov 2025

Actor:	Driver (User), ParkMate System, Google Maps Application, Browser
Description:	ParkMate allows users to open a carpark location in their device's Google Maps application.
Preconditions:	User has selected a carpark from the map.
Postconditions:	User is given the choice to use Google Maps through the Google Maps Application, or the Browser
Priority:	High
Frequency of Use:	High
Flow of Events:	<ol style="list-style-type: none"> <li>1. User opens the carpark to show the details window(#1-8).</li> <li>2. User selects "Open in Google Maps"</li> <li>3. ParkMate presents the user with a choice to open Google Maps through the Google Maps Application or through the Browser.</li> <li>4. User selects the Google Maps Application</li> <li>5. Routing is calculated through the Google Maps Application</li> </ol>
Alternative Flows:	<ol style="list-style-type: none"> <li>1. User opens the carpark to show the details window(#1-8).</li> <li>2. User selects "Open in Google Maps"</li> <li>3. ParkMate presents the user with a choice to open Google Maps through the Google Maps Application or through the Browser.</li> <li>4. User selects the Browser</li> <li>5. Routing is calculated through the Google Maps Web App.</li> </ol>
Exceptions:	none
Includes:	none
Special Requirements:	None
Assumptions:	Device has internet connectivity

Notes and Issues:	none
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## V. For Functional Requirement #5

### a. View & Manage Carpark Selection History

Use Case ID:	#5-1		
Use Case Name:	View & Manage Carpark Selection History		
Created By:	Yibin	Last Updated By:	Abdillah
Date Created:	09 Sept 2025	Date Last Updated:	14 Nov 2025

Actor:	Driver(user), Parkmate System
Description:	View and manage their Carpark Selection History in ParkMate. The system automatically records selected carparks and allows users to revisit them.
Preconditions:	<ul style="list-style-type: none"> <li>User must be logged in.</li> <li>User has previously selected at least one carpark to generate history entries.</li> </ul>
Postconditions:	<p>Success:</p> <ul style="list-style-type: none"> <li>User's history of selected carpark is displayed.</li> </ul> <p>Failure:</p> <ul style="list-style-type: none"> <li>ParkMate displays a non-blocking message and loads locally cached entries if available.</li> </ul>
Priority:	Medium
Frequency of Use:	Medium
Flow of Events:	<ol style="list-style-type: none"> <li>User navigates to the History Tab from the Profile Page or main navigation.</li> <li>ParkMate retrieves and displays the list of previously selected carparks.</li> <li>Each history row displays the carpark name and timestamp.</li> <li>User taps a history entry to reopen the Carpark Details and set it as the current selection.</li> <li>ParkMate updates the history list immediately and syncs the changes.</li> </ol>
Alternative Flows:	<p>Empty History:</p> <ol style="list-style-type: none"> <li>If there is no carpark selection history exists for the user (first-time use or cleared data).e, ParkMate displays a message: "No history found. Start selecting carparks to build your history."</li> </ol> <p>Logged out:</p> <ol style="list-style-type: none"> <li>If User is not logged in, ParkMate displays only local (on-device) selection history and a prompt: "Log in to sync your full carpark history across devices."</li> </ol>

Exceptions:	<ol style="list-style-type: none"><li>1. If History sync to the server fails due to network or API outage, ParkMate displays a message: “Unable to sync carpark history. Changes will be synced when you are online.”</li><li>2. If Corrupted or unreadable history data (local or server-side), ParkMate displays an error: “History data could not be loaded.</li></ol>
Includes:	#1-7
Special Requirements:	None
Assumptions:	User may be offline; local storage is available
Notes and Issues:	None

## VI. For Functional Requirement #6

### a. Toggle EV mode

Use Case ID:	#6-1		
Use Case Name:	Toggle EV mode		
Created By:	Abdi	Last Updated By:	Yibin
Date Created:	11 Nov 2025	Date Last Updated:	11 Nov 2025

Actor:	User (EV Driver), ParkMate System
Description:	This use case lets ParkMate change its whole UI to suit EV functionality. The UI colour scheme will be changed to a green colour and the filter functions and sorting navigation tabs will be changed.
Preconditions:	1. User has logged in.
Postconditions:	1. The UI is successfully switched to EV Mode. 2. EV-related filters and navigation options become active
Priority:	Medium-High (Enhances user personalization and usability for EV drivers)
Frequency of Use:	Medium-High
Flow of Events:	1. The user opens the profile menu. 2. The user selects the EV Mode toggle. 3. The system updates the UI and switches to EV Mode.
Alternative Flows:	None
Exceptions:	EX-01: Failure to load EV mode 1. If the system fails to load EV mode resources, the toggle is not applied and an error is displayed.
Includes:	None
Special Requirements:	None
Assumptions:	AS-01: User owns an EV 1. User has an EV and requires to use EV mode
Notes and Issues:	None

### b. Filter by Connector Type & Charging Speed

Use Case ID:	#6-2		
Use Case Name:	Filter by Connector Type & Charging Speed		
Created By:	Harshil	Last Updated By:	Preetham
Date Created:	19 Oct 2025	Date Last Updated:	15 Nov 2025

Actor:	User (EV Driver), ParkMate System
Description:	This use case lets EV users filter and sort carparks or charging stations based on their vehicle's plug type and preferred charging speed (Type 2, CCS 2 (Fast), CHAdeMO, CCS2, CC2). It helps users quickly find chargers that are compatible with their car and reduce waiting time by showing only stations that match their needs.
Preconditions:	<ol style="list-style-type: none"> <li>1. User has opened the Search Results or Map View after entering a destination.</li> <li>2. Connector type and power information are included in the dataset</li> </ol>
Postconditions:	Map updates to show only stations that match the selected connector type and speed.
Priority:	Medium (Enhances user personalization and usability for EV drivers)
Frequency of Use:	Medium (Users are likely to apply filters during every search session)
Flow of Events:	<ol style="list-style-type: none"> <li>1. The user opens the Filter menu on the search or map screen.</li> <li>2. ParkMate shows a section labeled "EV Charger Filters."</li> <li>3. The user selects a preferred charging speed</li> <li>4. The user taps Apply Filters.</li> <li>5. ParkMate updates the map and list instantly, showing only chargers that meet the criteria.</li> <li>6. If no stations match, the system displays a message suggesting to clear or adjust filters.</li> </ol>
Alternative Flows:	<ol style="list-style-type: none"> <li>1. To clear filters, The user taps "Reset All." and ParkMate resets the results to show all carparks and EV stations again.</li> <li>2. When live data refreshes, ParkMate keeps the active filters and updates only the visible chargers that match them.</li> </ol>
Exceptions:	If a refresh fails while filters are active, cached data remains visible until the next update.
Includes:	NIL
Special Requirements:	<ul style="list-style-type: none"> <li>• Results update immediately when filters are applied, no need to reload the whole page.</li> </ul>

	<ul style="list-style-type: none"><li>• ParkMate remembers the user's last chosen connector and speed preferences for the next session.</li><li>• Users can select multiple connector types and charging speeds simultaneously.</li><li>• Each filter option includes both icons and text for accessibility.</li><li>• Filters rely on standardized connector names from LTA or operator datasets.</li></ul>
Assumptions:	<ul style="list-style-type: none"><li>• The app has access to structured metadata for each EV station (connector type, speed).</li><li>• At least one filterable EV attribute (type or speed) is available for every listed station.</li></ul>
Notes and Issues:	NIL

### c. EV carpark sorting

Use Case ID:	#6-3		
Use Case Name:	Sort EV Carparks (Favourites & Nearby)		
Created By:	Abdi	Last Updated By:	Yibin
Date Created:	11 Nov 2025	Date Last Updated:	11 Nov 2025

Actor:	User (EV Driver), ParkMate System
Description:	This use case enables the EV driver to sort EV-enabled carparks based on Favourites or Nearby options. When sorting is applied, ParkMate reorganizes the carpark list according to the selected criterion:
Preconditions:	<ol style="list-style-type: none"> <li>1. User is logged in</li> <li>2. Location Services are enabled. (required for nearby sorting)</li> </ol>
Postconditions:	<ol style="list-style-type: none"> <li>1. Carpark list is sorted based on the chosen criterion.</li> <li>2. UI reflects updated sorted order.</li> </ol>
Priority:	Medium-High (Enhances user personalization and usability for EV drivers)
Frequency of Use:	Medium-High
Flow of Events:	<ol style="list-style-type: none"> <li>1. The user navigates to the EV Carpark List screen.</li> <li>2. The user opens the sorting menu.</li> <li>3. The user selects either Favourites or Nearby.</li> <li>4. The system retrieves relevant data (favourites list or location).</li> <li>5. The system sorts the EV carparks accordingly</li> <li>6. The UI updates to show the new sorted order.</li> </ol>
Alternative Flows:	<p>AF-01: Location Permission Denied</p> <ol style="list-style-type: none"> <li>1. If user selects Nearby but location access is disabled, the system prompts the user to enable location permission.</li> </ol>
Exceptions:	<p>EX-01: System fails to retrieve favourite list</p> <ol style="list-style-type: none"> <li>1. System displays unsorted list and notify user.</li> </ol>
Includes:	None
Special Requirements:	<p>SR-01: Sorting under specific time requirement</p> <ol style="list-style-type: none"> <li>1. Sorting must complete within 1 second under normal network conditions.</li> </ol>
Assumptions:	AS-01: User has at least one favourite carpark
Notes and Issues:	None