VISITOR MANAGEMENT MODEL FOR PARKS

Visitor Simulations in Protected Areas:

Advances in Recreation Management

Presentation

- ➢ Aims
- ➢ Background
- ➢ Visitor Management Model
- ➢ Project Results
- ➢ Future Directions
- ➢ Potential Applications

BROAD AIM

➢ Develop a comprehensive visitor management model for Parks Victoria and trial at Port Campbell National Park

AIMS

➢ Guide future operational management decisions by exploring visitor management scenarios relating to conservation, tourism and visitor services

➢ Be a prototype for use at other parks around Australia

➢ Technologically innovative

At Twelve Apostles, identify and evaluate:

➢ existing and projected movements of pedestrians and vehicles along old and new roads, tracks and car parks.

➢ potential bottlenecks and overloads that may occur and under what conditions these problems will occur.

➢ any negative impact on visitors (eg. waiting times, no access, crowding).
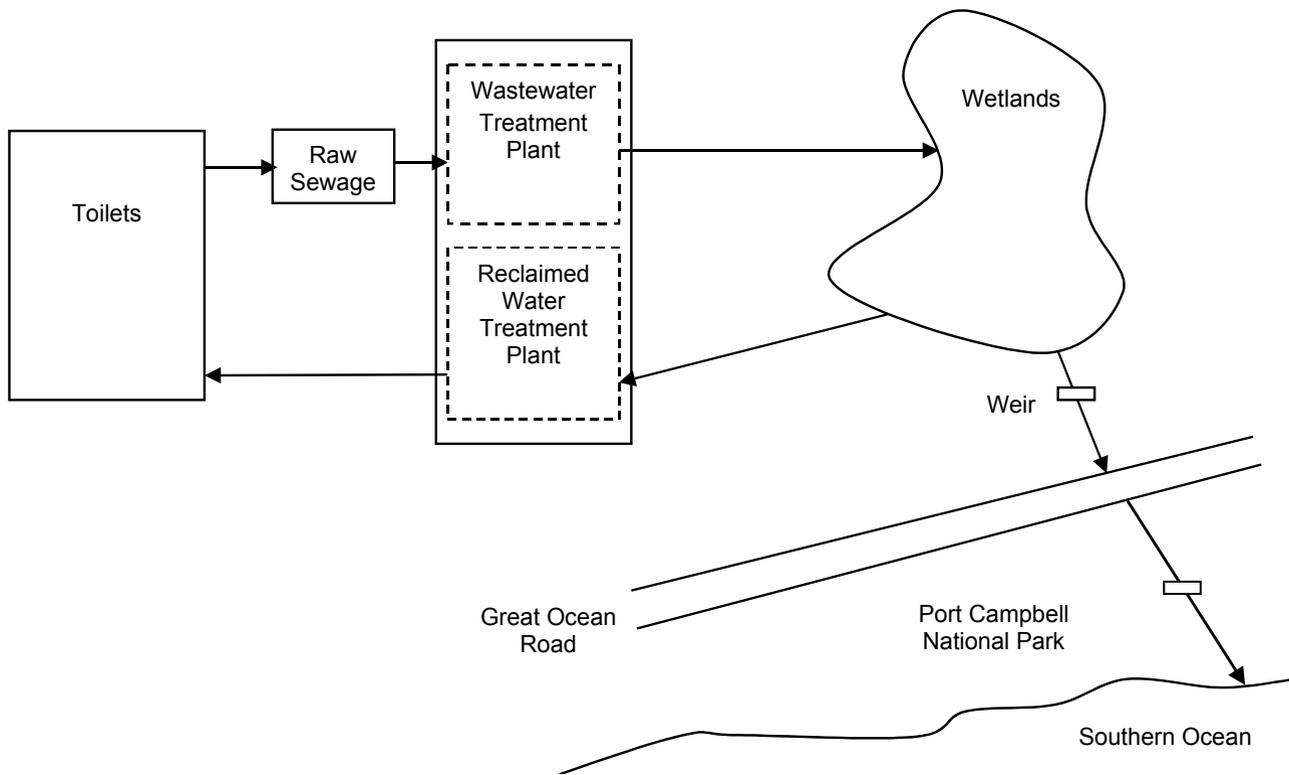
BACKGROUND

Twelve Apostles site (prior to facility development):

- 2.1 million visitors, growing at 3.6%

- No toilet

- 28 car parking bays

- Visitors > site capacity

- Environmental degradation

Masterplan

Enlarged environmental area for amenity and storm water retention

Softened visual impa[ct]
extensive planting o[f]
indigenous trees an[d]

Separation of car and bus traffic to improve pedestrian safety

Single entry from Booringa Road for improved access and traffic flow

Vehicles remov[ed]
National Park a[nd]
revegetated

TO APOLLO

[TO] PORT CAMPBELL

OCEAN

GREAT

ROAD

TO LO[RNE]

TWELVE APOSTLES MARCH 2001

Twelve Apostles site (post facility development):
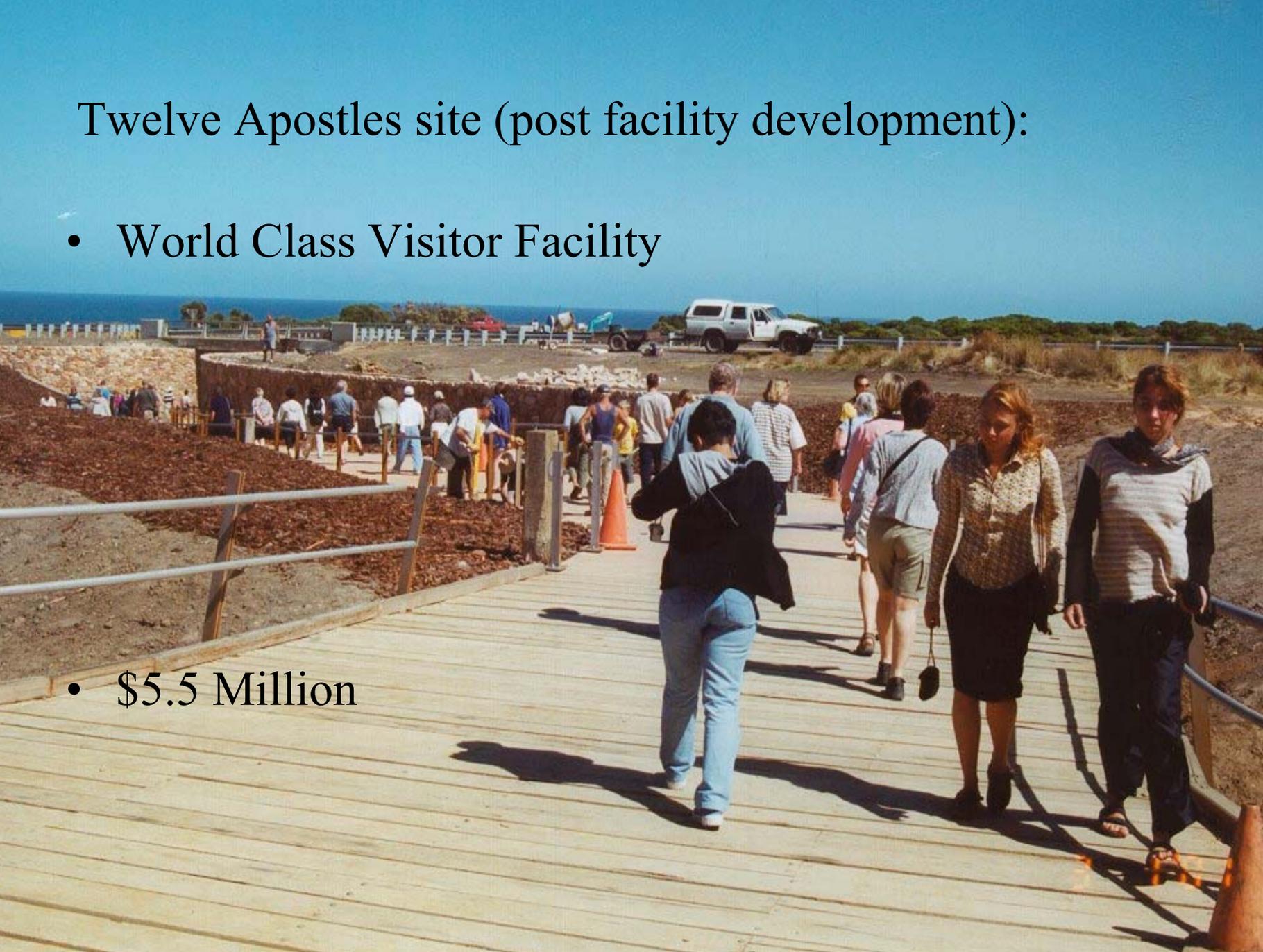
Twelve Apostles site (post facility development):

- World Class Visitor Facility

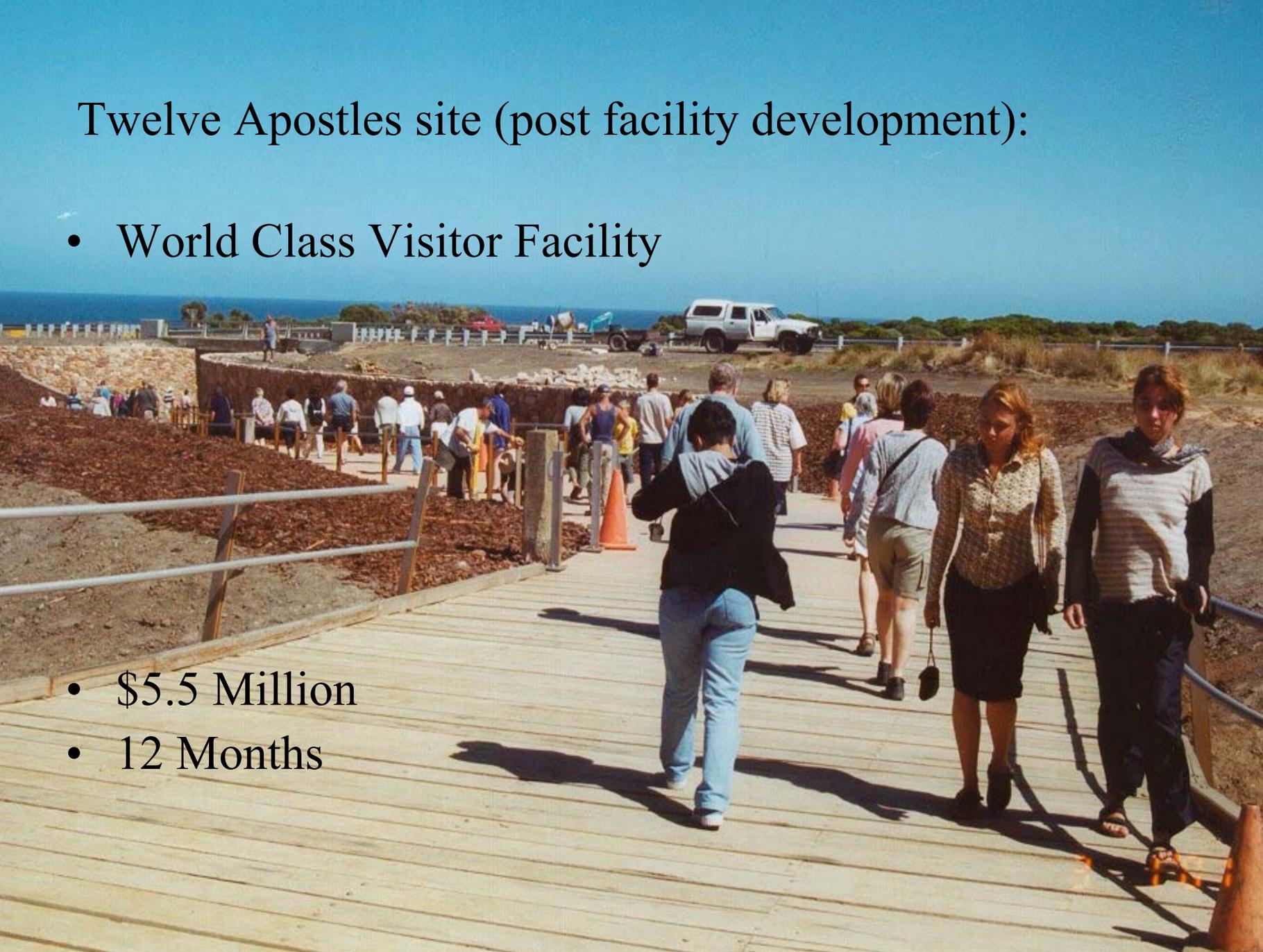Twelve Apostles site (post facility development):

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- World Class Visitor Facility

- $5.5 Million
- 12 Months
- Increased Operational Efficiency
- Reduced Environmental Impacts
- Increased Visitor Satisfaction

MANAGEMENT QUESTIONS

At Twelve Apostles, appraise:

➢ How well will the new facilities at Twelve Apostles cope with growing visitor loads?

➢ How crowded will the site get in the future?

➢ How will visitor satisfaction be affected by the new facilities and growing visitor numbers?

➢ How is length of stay affected by the new configuration of the Twelve Apostles site?

BACKGROUND

- **Joint funded project**
  - $100K grant from Office of National Tourism Dept in 1997, $110K from Parks Victoria.
- **Tendered for Stage 1 development in March 1999.**
  - most technically innovative
  - geographical (GIS) & intelligent agent based simulation
  - most potential to simulate what is the "real" world
  - demonstrated the RBSim at Broken Arrow Canyon, Sedona Arizona, USA

VISITOR MANAGEMENT MODEL

What Is It?

➢ **A visual computer program known as the Recreation Behaviour Simulation (RBSim2)**

➢ **Simulates the behaviour of individual agents - both pedestrians and vehicles on linear recreation networks.**

➢ **The simulation will be able to predict what will happen in "what if scenarios":**

- ♦ infrastructure is changed
- ♦ visitor growth occurs
- ♦ visitor controls change

VISITOR MANAGEMENT MODEL

RBSim integrates two technologies:

- Geographic Information Systems (GIS) to capture environmental conditions and recreation facilities
- Intelligent agents – to simulate human behaviour

VISITOR MANAGEMENT MODEL

RBSim imports GIS data:

- Road and trail networks
- Facility locations (parking, visitor centres, camp sites)
- Facility attributes (visitor capacity, typical visit duration, site qualities)
- Elevation data (used to calculate slope, intervisibility)

VISITOR MANAGEMENT MODEL

Agents:

- combined knowledge derived from empirical data and the intuition of the programmer.

- autonomous – once programmed, they move about the environment gathering information and use it to make decisions and alter their behaviour according to specific environmental circumstances generated by the simulation.

VISITOR MANAGEMENT MODEL

- Each agent has a "typical trip" which is defined by:
  - A network
  - An entry node
  - A travel mode
  - A set of destination nodes and visit durations
  - An exit node
  - An arrival curve

Network
Networkv8

Select Entry Node
SimpsonRD

Select Exit Node
Princetown

Description
Car Entry at SimpsonRD exit at Princetown for 90 vehicles.

Travel Mode   Car

Enter Minimum Duration of Trip (Minutes)   80.8

Enter Average Duration of Trip (Minutes)   101

Enter Maximum Duration of Trip (Minutes)   121.2

VISITOR MANAGEMENT MODEL

- Arrival curves plot arrival rates over a 24 hour day for specified days of the week throughout the year.

VISITOR MANAGEMENT MODEL

- Each agent can have a different set of rules.

- The order that an agent executes rules is important.

- RBSim allows the user to change the order that rules execute.
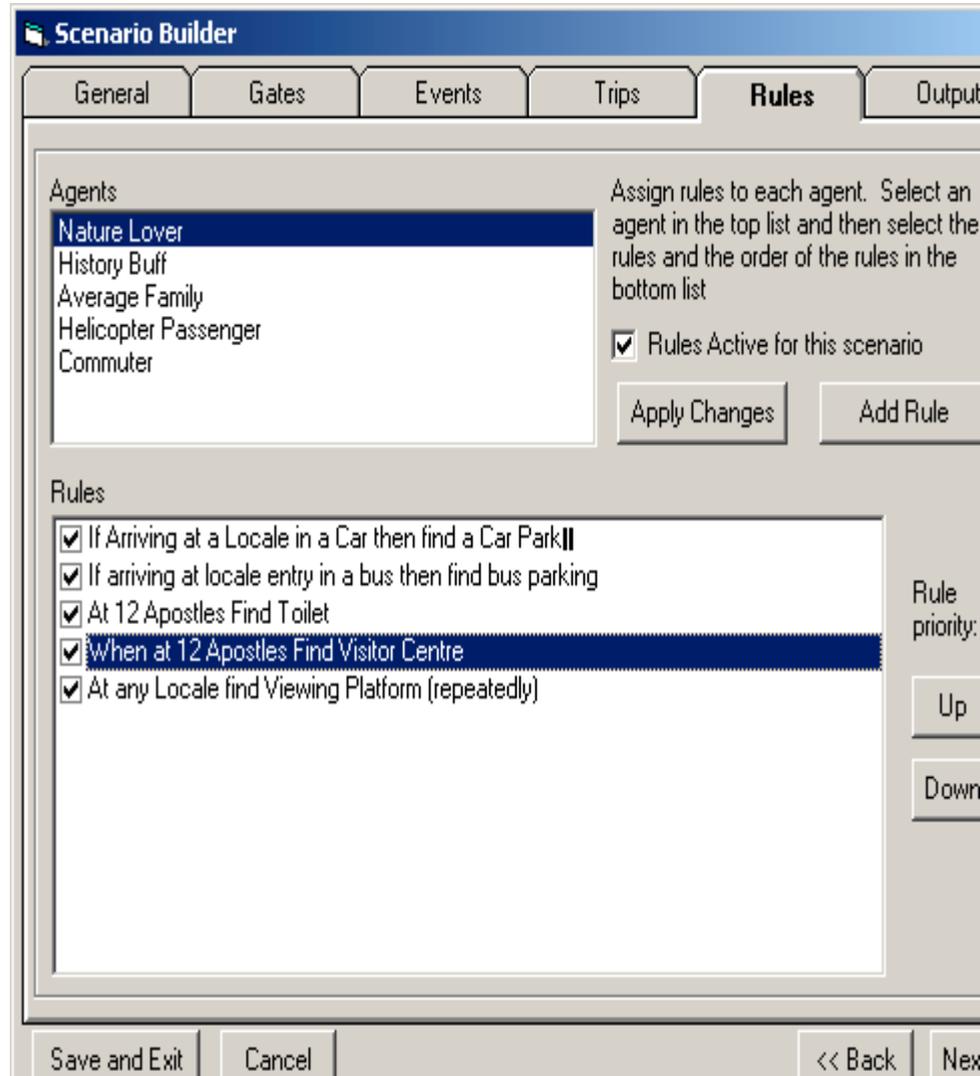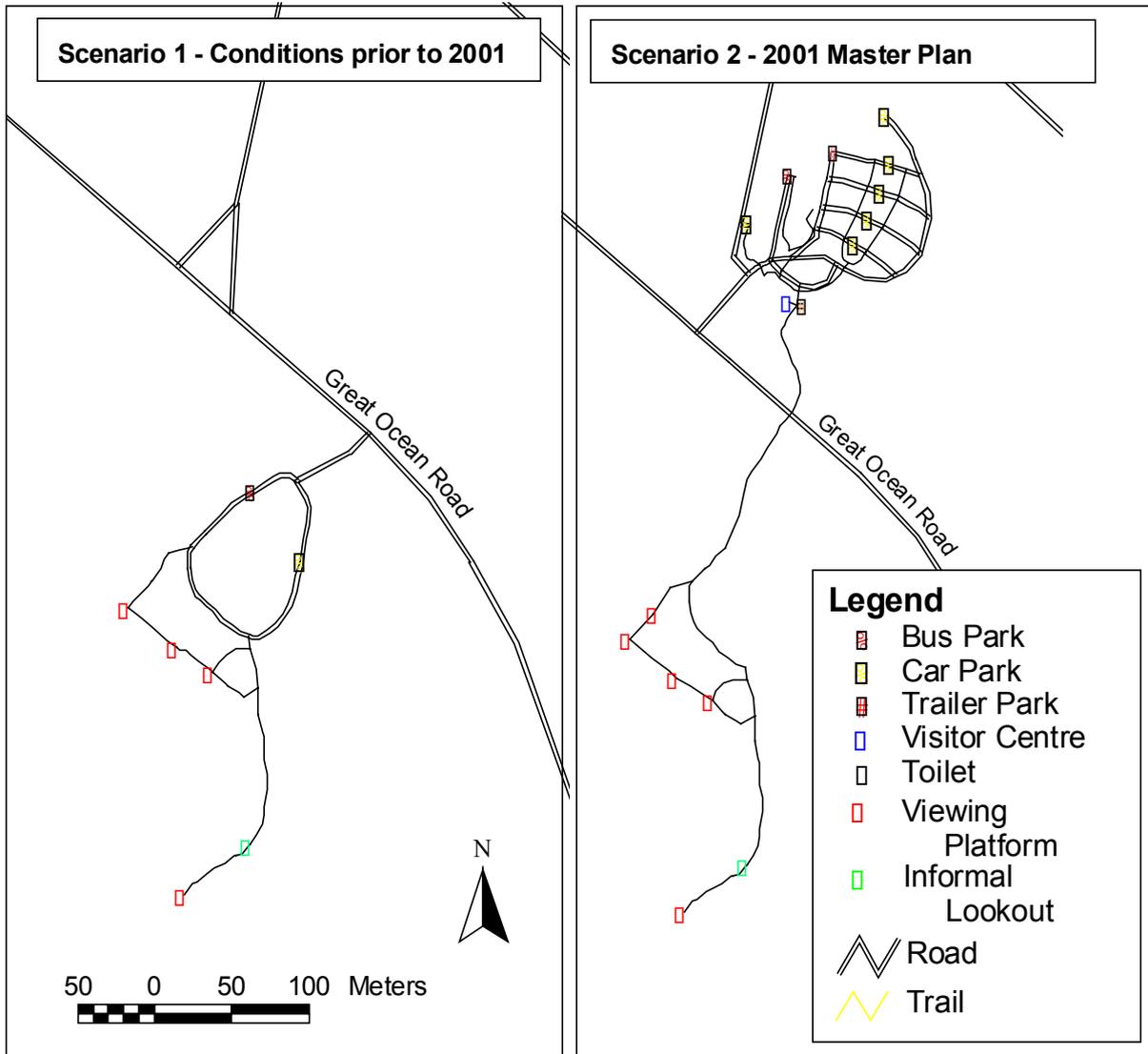
PROJECT RESULTS

- Three scenarios evaluated
  - "Old" vs "New" Facilities with 2001 Peak Visitor Load
  - "New" Facilities with Visitor Loads in 2006 & 2011 (3.5% car & 7% bus compound growth per annum)
  - "New" Facilities with Overflow Car park Open in 2006 & 2011
- Five Criteria used
  - car & bus parking capacity
  - Successful trips
  - Crowding or visitor encounters
  - Queuing times
  - Length of stay
- Six runs completed & averaged for variability

Scenarios

Scenario 1 - Conditions prior to 2001

Scenario 2 - 2001 Master Plan

Great Ocean Road

Great Ocean Road

Legend

- ⅋ Bus Park
- ⅋ Car Park
- # Trailer Park
- Visitor Centre
- Toilet
- Viewing Platform
- Informal Lookout
- N Road
- N Trail

N

50   0   50   100   Meters

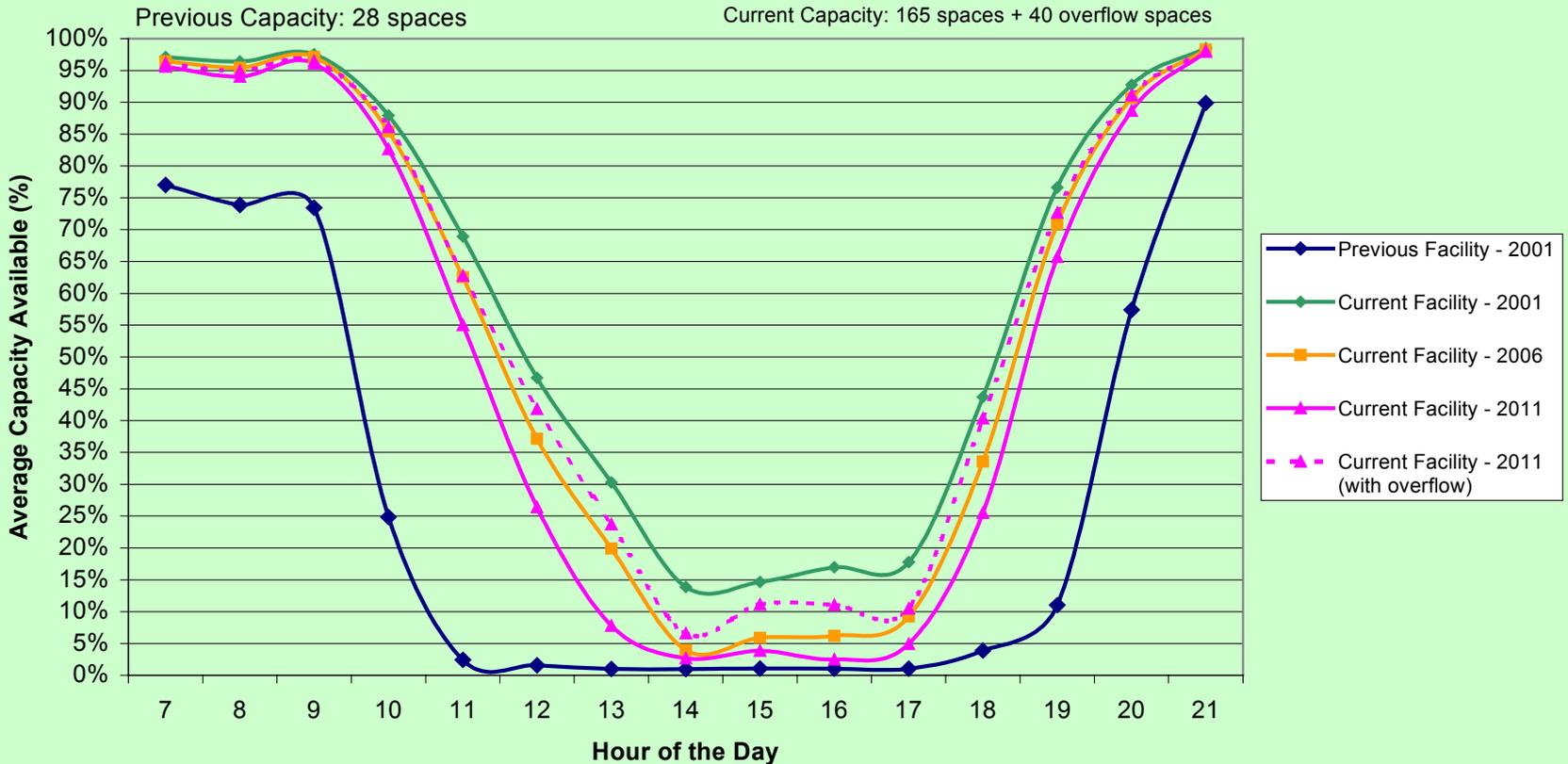| Facility	S1	S2
Viewing Platform	345 People	345 People
Informal Lookout	5 People	30 People
Bus Park	6 Buses	12 Buses
Car Park	30 Cars	245 Cars
Visitor Centre	None	100 People
Toilet	None	29 People
Trailer Park	None	12 Car

Simulation Runs

Scenario 1
Pre-master plan
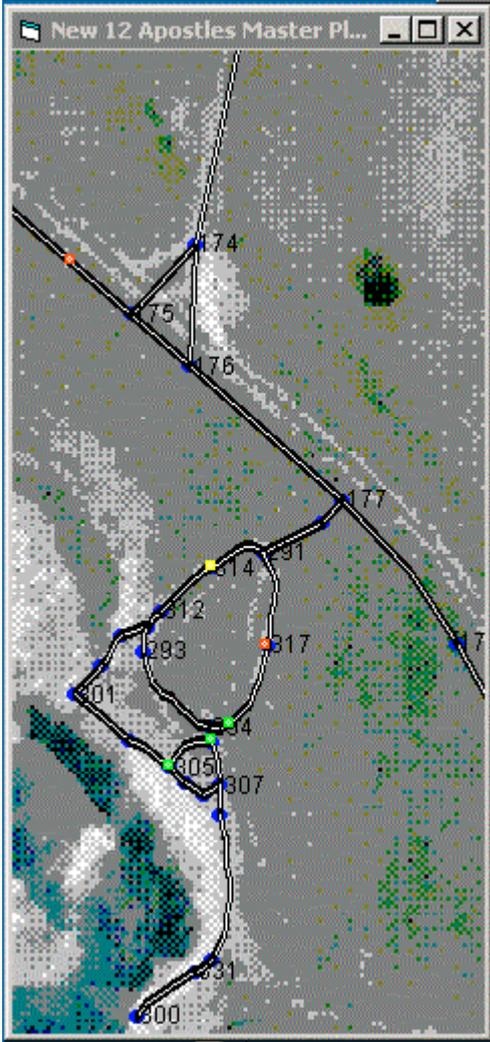
Scenario 2
2001
Master plan
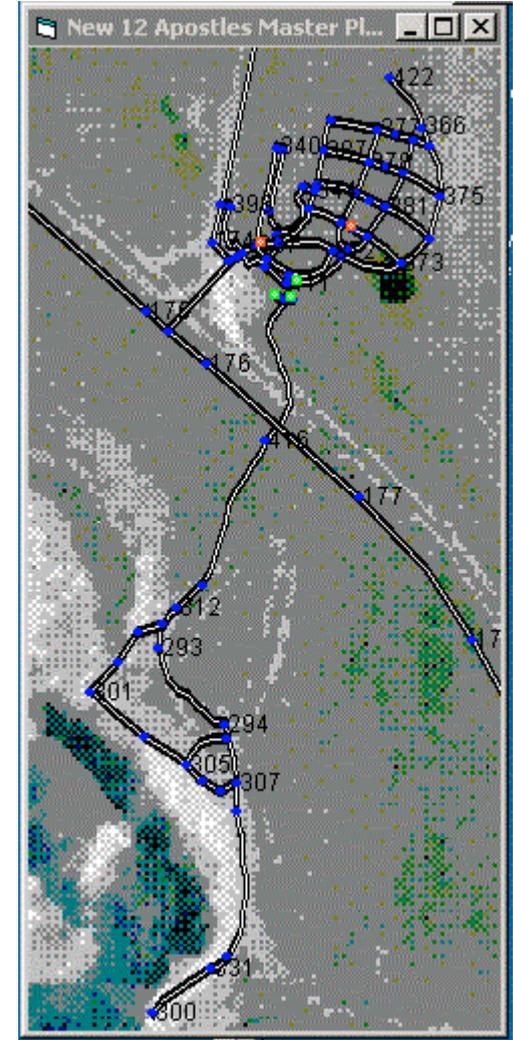
"New" Facilities in 2006 & 2011 with Overflow Car Park Available

Current Facility Projections - 2001, 2006, 2011
Average Available Car Park Capacity

Previous Capacity: 28 spaces

Current Capacity: 165 spaces + 40 overflow spaces

Legend:
- Previous Facility - 2001
- Current Facility - 2001
- Current Facility - 2006
- Current Facility - 2011
- Current Facility - 2011 (with overflow)

X-axis: Hour of the Day
Y-axis: Average Capacity Available (%)

✖ **Car park capacity is reached between 1pm & 5pm in 10 years even with relief from overflow car park.**

"New" Facilities with Visitor Loads in 2006 & 2011

Current Facility Projections - 2001 v 2006 v 2011
Minimum Available Bus Park Capacity

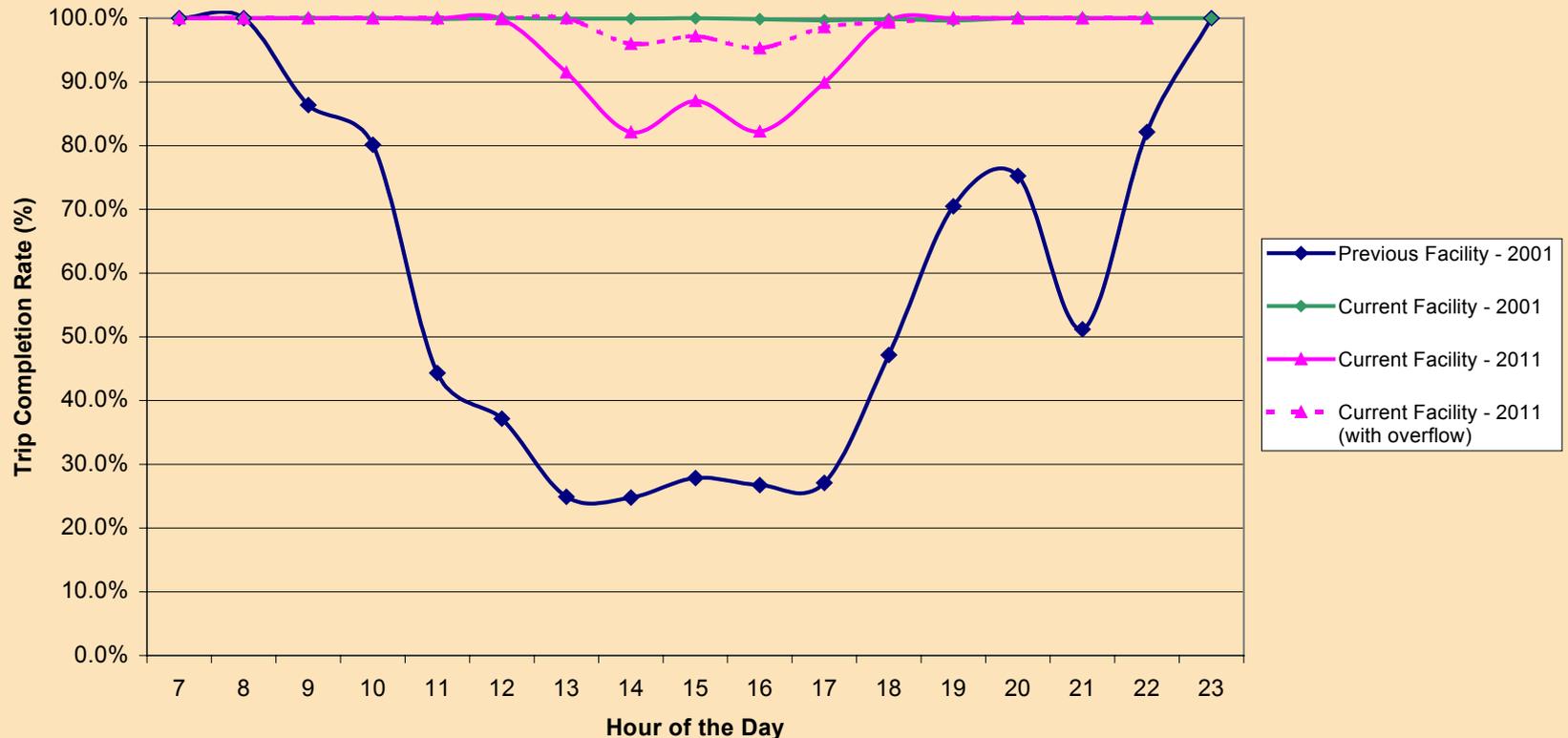Current Capacity: 12 spaces

- Current Facility - 2001
- Current Facility - 2006
- Current Facility - 2011

Minimum Capacity Available (%) — *Hour of the Day*
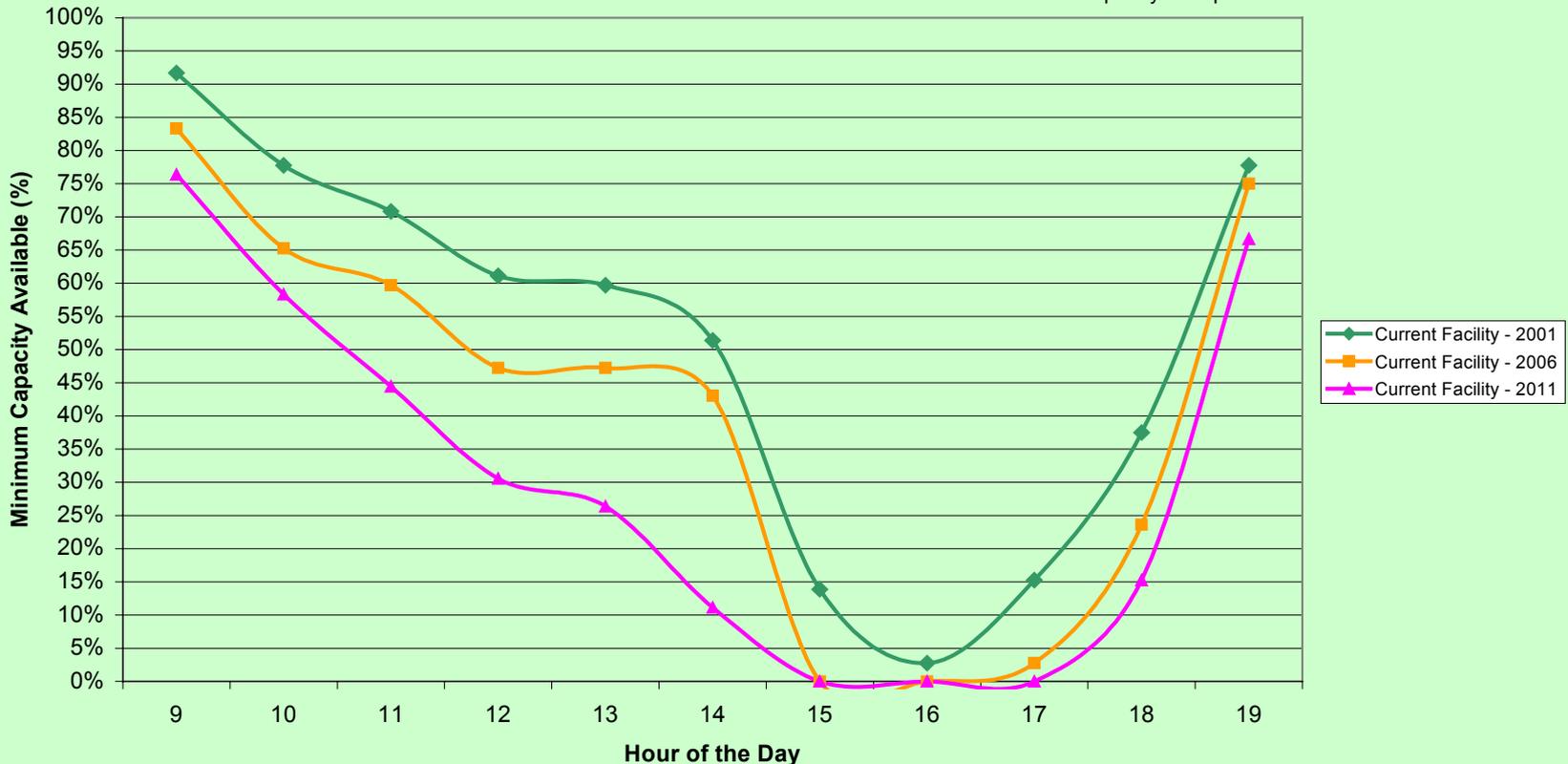
✘ **Bus parking capacity will have problems at times between 3 to 5 pm within 2 to 3 years.**

"Old" Facilities in 2001 compared to "New" in 2011

Current vs Previous Facility Projections - 2001, 2006 & 2011
Trip Completion Rate with Overflow Car Park Open

Legend:
- Previous Facility - 2001
- Current Facility - 2001
- Current Facility - 2011
- Current Facility - 2011 (with overflow)

Y-axis: Trip Completion Rate (%)
X-axis: Hour of the Day

✓ **Trip Completion Success Rates will be sustained and won't be as low as previous for 10+ years.**

"Old" vs "New" Facilities with Visitor Load in 2001

Current Facility Projections - 2001, 2006 & 2011
Average Visitor Encounters at Lookouts with Overflow Car Park Open

Legend:
- Previous Facility - 2001
- Current Facility - 2001
- Current Facility - 2011 (with overflow)

X-axis: Hour of the Day
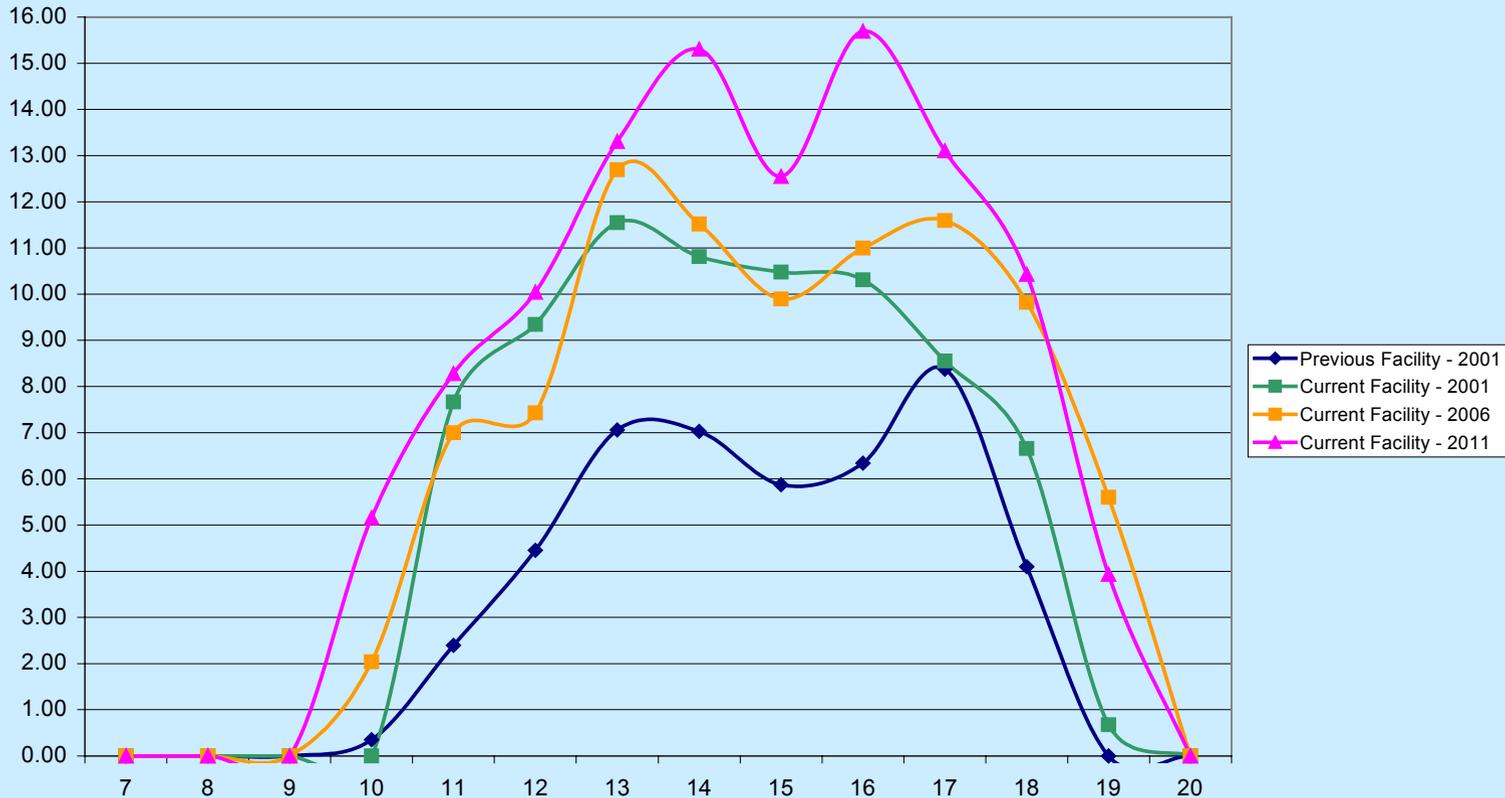Y-axis: Average Visitor Encounters
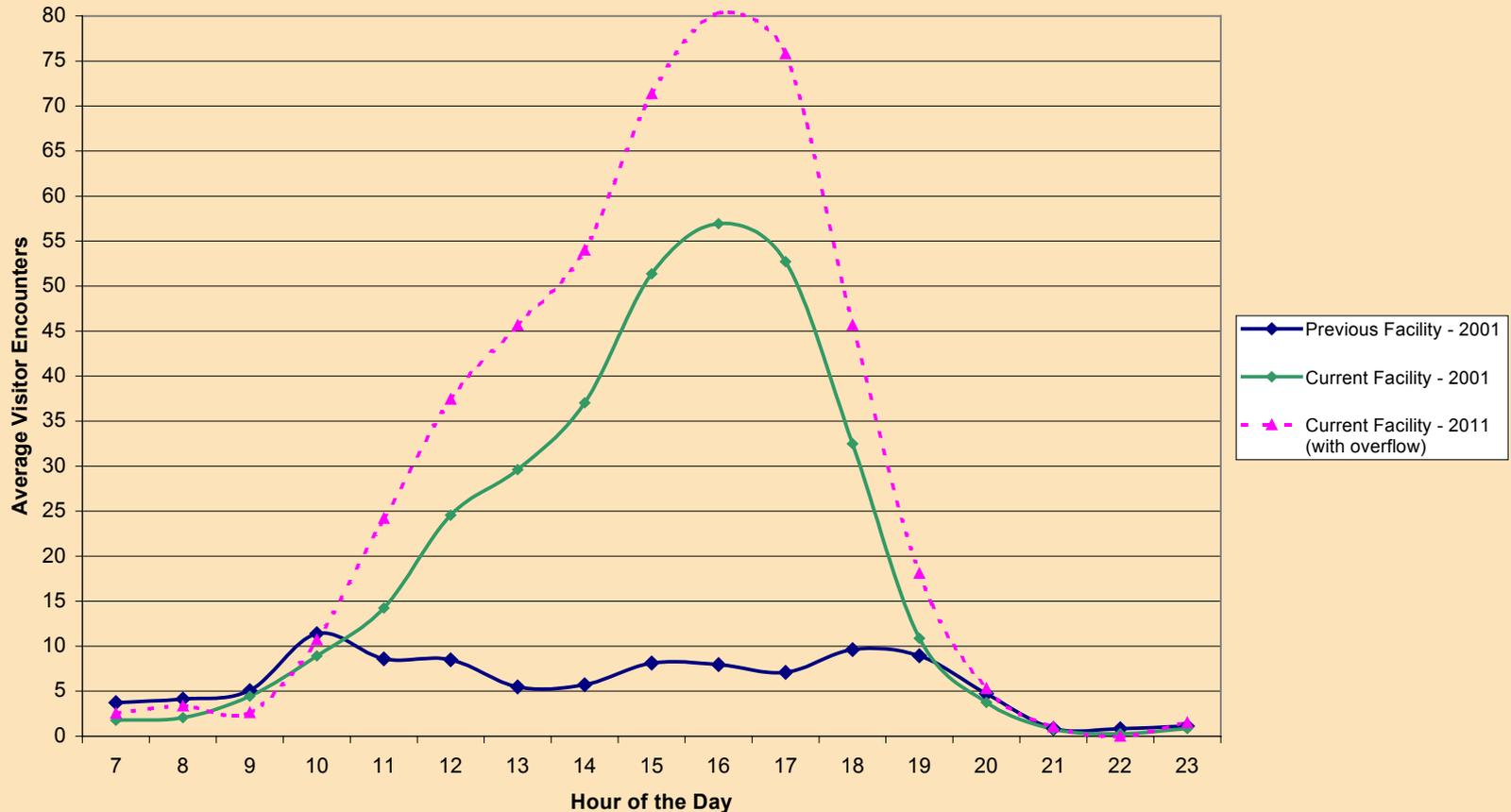
✖ **Crowding at look outs will offset satisfaction gains**

✖ **May require new look outs?**

"Old" vs "New" Facilities in 2001, 2006 & 2011

Current Facility Projections - 2001 v 2006 v 2011
Maximum Queuing Time at Car Parks

Legend:
- Previous Facility - 2001
- Current Facility - 2001
- Current Facility - 2006
- Current Facility - 2011

✖ **Maximum queuing time increase substantially with car park size and time.**

Actual vs Model Visitor Behaviour

Previous Facility v Current Facility
Length of Stay (Successful Trips)
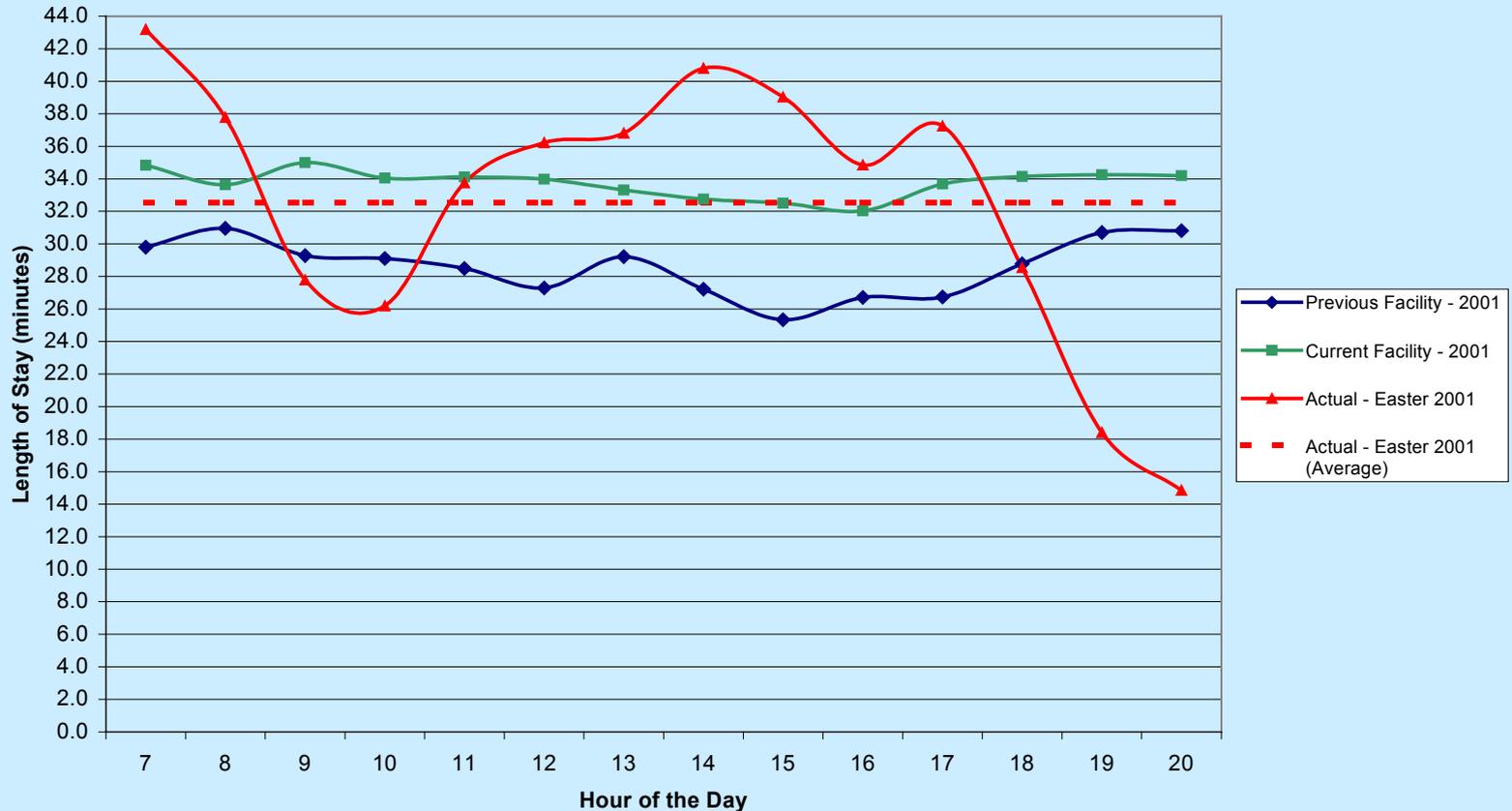
✓ **Actual length of Stay varies but is close to model.**

MANAGEMENT IMPLICATIONS

❶ Bus parking will need to be managed between 3:00 pm to 5:00 pm within 5 years (eg. redirect buses or use informal spaces near the visitor centre).

❷ The car park will need an alternative solution, ie limit entry, redirection or extension, in 10 years particularly between 1:00 & 5:00 pm.

❸ Viewing platforms will have to be increased in capacity in the 5 to 10 year time horizon if the overflow car park is used or if the car park is extended further.

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  - ♦ management controls on visitor behaviour?

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- Other potentially large infrastructure investments, eg. Loch Ard Gorge assessment

- Paths with user modal conflicts, ie horse riders & mountain bikers

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- ◆ management controls on visitor behaviour?

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- ◆ Paths with user modal conflicts, ie horse riders & mountain bikers

➢ Extend Model

- ◆ environmental impacts by analysis of "non compliant" behaviour of visitors, ie trampling?

- ◆ validation of pedestrian movements and library of agents?

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✓ Assist in planning for recreation management