CLIENTS | PEOPLE | PERFORMANCE

Asset and Infrastructure Management for Airports

Larissa James| Principal Consultant, GHD Consulting Inc



ACRP 01-16 Asset and Infrastructure Management for Airports

Long Survey Participants
Miami International Airport
Corpus Christi International Airport
Toronto Pearson International Airport
Cincinnati/Northern Kentucky Int. Airport
Churchill Manitoba Airport
Jackson Municipal Airport
Minneapolis/St. Paul International Airport
Sacramento International Airport
Fresno Yosemite International Airport
Hartsfield-Jackson Atlanta International Airport
Chicago O'Hare International Airport
Dallas/Fort Worth International Airport
Reno-Tahoe International Airport
McCarran International Airport
Bangor International Airport
Greenville Spartanburg International Airport
Palm Springs International Airport
Jacksonville International Airport
Oakland International Airport
Charlottetown Airport
Memphis International Airport
Seattle Tacoma International Airport
Vancouver International Airport
Winnipeg Airports Authority
Springfield Branson National Airport
Salt Lake City International Airport
Louisville International Airport
Louis Armstrong New Orleans Int. Airport
Addison Airport
San Francisco International Airport
Tallahassee Regional Airport
Washington Dulles International Airport
Nashville International Airport
Gatwick, UK

Short Survey Participants

Large Hub
Addison Airport
Arlington Municipal Airport
Baltimore Washington International Airport
Chicago O'Hare International Airport
Denver International Airport
Detroit Metro Airport
George Bush Intercontinental Airport
Minneapolis/ St. Paul International Airport

Medium Hub
Austin Bergstrom International Airport
Cincinnati/Northern Kentucky
Colorado Springs Municipal Airport
General Mitchell International Airport
Lambert St. Louis International Airport
Manchester Boston Regional Airport
Memphis International Airport
Sacramento International Airport
South West FL. International Airport
Vancouver International Airport
Albuquerque International Airport

Non-Hub
Bangor International Airport
Grand Canyon National Park Airport
Metropolitan Knoxville Airport Authority
Missoula International Airport
Pittsburgh International Airport
Saint John Airport Canada

Small Hub
San Diego International Airport
Atlantic City International Airport
Baton Rouge International Airport
Corpus Christi International Airport
Des Moines International Airport
Fresno Yosemite International Airport
Gerald Ford International Airport
Greenville Spartanburg International Airport
Huntsville International Airport
Long Island Macarthur Airport
Preston Smith International Airport
Tallahassee Regional Airport
Tucson International Airport
Tulsa International Airport
Valley International Airport
Wichita Mid-Continent Airport

Site Visits
Dallas/Fort Worth International Airport
Miami International Airport
Addison Airport
Greenville Spartanburg International Airport
Sacramento International Airport
Toronto Pearson International Airport
Bangor International Airport
Gatwick London Airport
Brisbane Airport Corporation
Auckland Airport
Charlotte Douglas International

Conference Calls
Port Authority of NY and NJ
Port of Seattle
Sarasota International Airport
Denver International Airport
Cincinnati International Airport

ement

ACRP 01-16 Asset and Infrastructure Management for Airports

- Primer outlines:
  - What asset management is
  - What the executive's role is in the implementation of an asset management framework

- Guidebook outlines:
  - What the components are of an Asset Management Framework
  - How to implement and improve an Asset Management Framework
  - How to develop an Asset Management Plan

Publish: Summer 2012

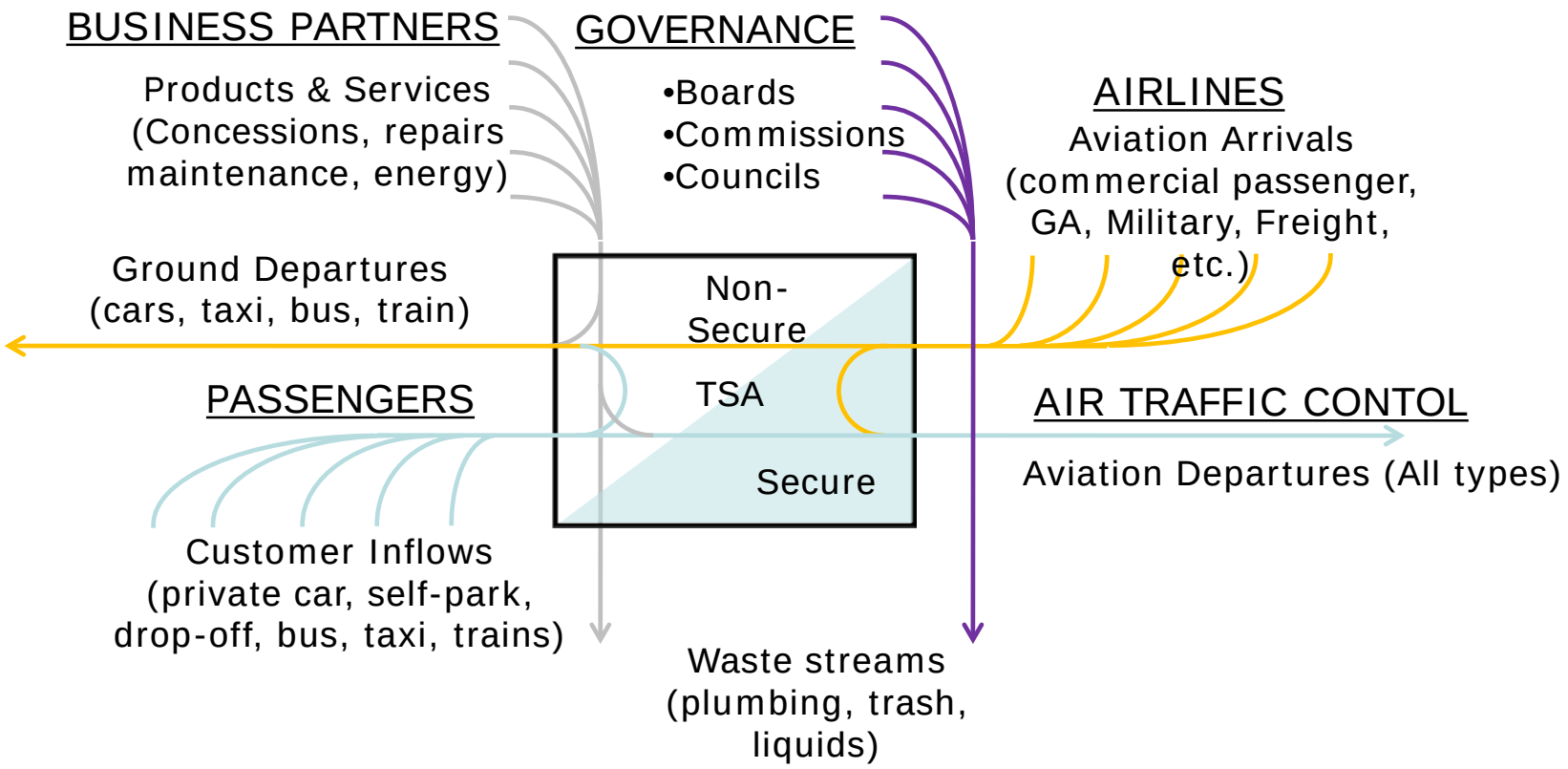
Key Airport Asset Management Objectives

- Achievement of **Levels of Service** specific goals and targets
  - Aircraft turnaround time (operational aspects)
  - Terminal capacity – passenger throughput
  - Performance standards for systems – code, regulatory, legislative compliance
- Reduce post budget **capital project shock**
- **Do more with less** – reduce budget, maintain performance/level of service
- Understand **future cash flows** needed to maintain levels of service
- **Future vision** into rates and charges

Overview

- The Airport Context for AM
- Asset Failures – the Range of Consequences
- AM Planning
- Implementation

Context for AM - Multiple Integrated Relationships



Airport Asset Management Complexity

- Multiple customer types
  - Airlines
  - Tenants
  - Passengers/Residents
  - Community
  - Regional economy

- Outside of regulated asset groups, many discretionary levels of service to consider

Multiple Impacts due to Asset Failures

- Typical Impacts
  - Wait times
  - Safety issues associated with crowding
  - Delayed flights
  - Negative media coverage
  - Impact on concessions (maybe positive or negative)
  - Impact on future use of the airport by impacted travellers

Power Failure to Airfield Lighting – Airport Closure

- 1000s delayed
- 17 flights diverted
- Major disruptions
- Media attention

Source: OneNews

Power Failure – Check In, Security impacts

Picture: Damian Shaw *Source:* The Sunday Telegraph
TheAustralian.com.au

Jetbridge Collapse LAX – Captain & Passenger Injured

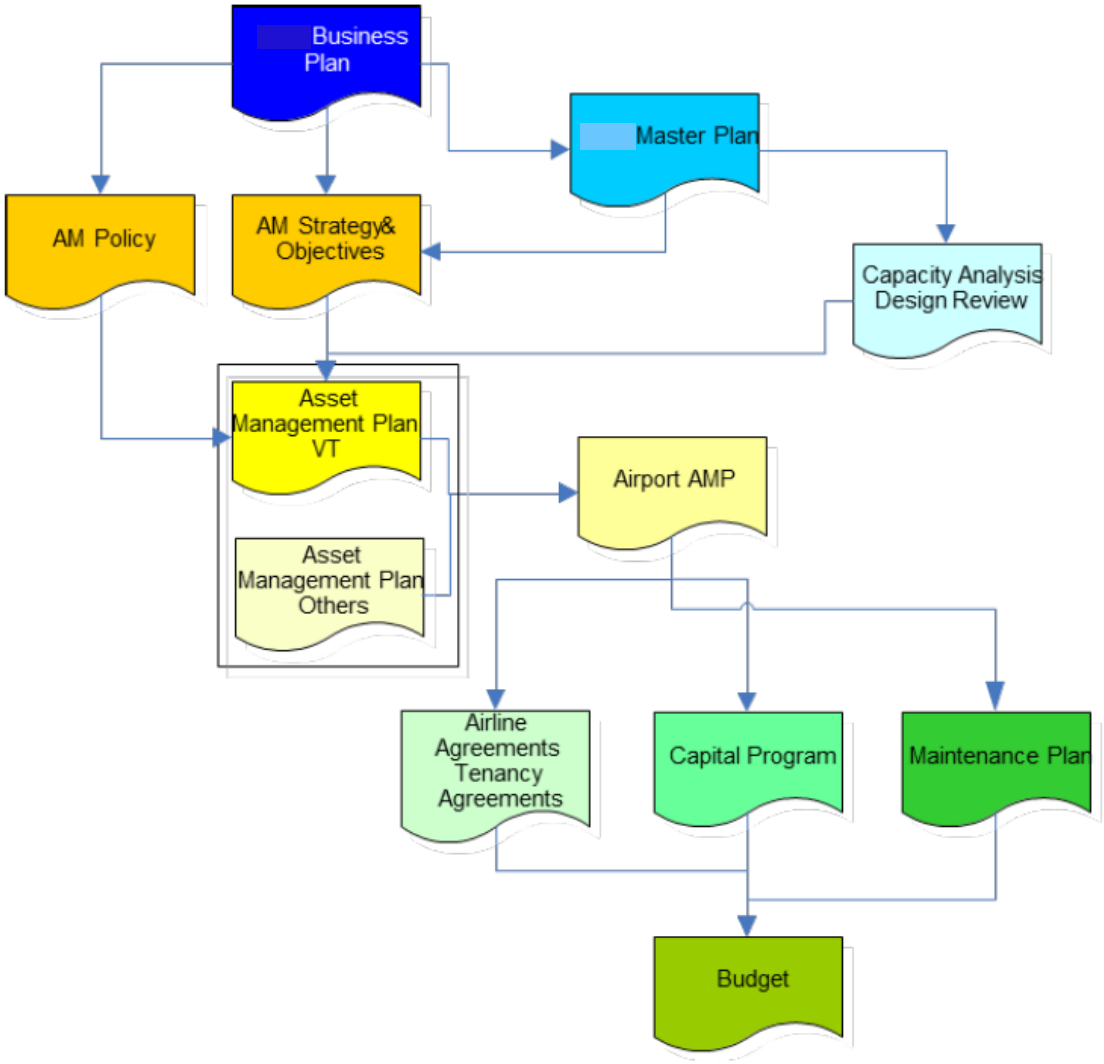
Photo: Crews inspect jet bridge damage. Credit: KTLA-TV News LA Times

Asset Management Plans

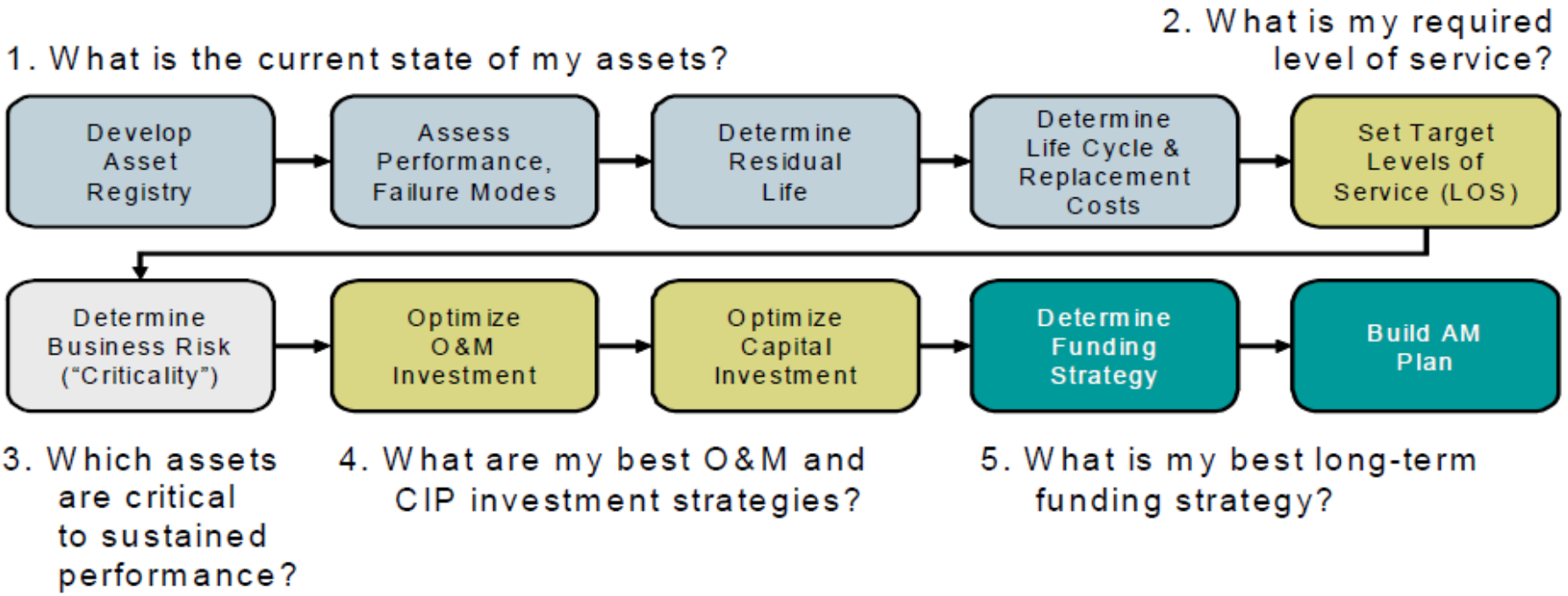
Often contain variants on the following content:

1. Overview of the Facility/System or Network
2. Levels of Service–Current performance and targets
3. Strategies and Investments to close performance gaps
4. Risk assessment
5. Risk mitigations
6. Renewal Plan
7. Demand and Growth
8. Capital Plan (new assets)
9. 10 year Infrastructure Investment Plan
10. 10 year Funding Plan
11. Business Improvement (business process, data)
12. Challenges for implementing the plan
13. Staffing requirements

Relationship to other plans and processes



Asset Management Planning Approach



Managing Operational Risk
Likelihood x Consequence

Operational Risk Assessment – Consequence of Failure Table

		Nil	Minor	Major	Critical	Extreme
Weighting	Score	1	2	3	4	5
	Type of Consequence					
5	Operating Budget Impact – Cost of Failure	No impact	<$50k	$50k - $100k	$ 100k- $200k	>$200k
10	Resource and Operational Impacts	No impact	Minimal impact managed by in house staff.	Disruption to operational process manageable by existing contract arrangements	Possible disruption to stakeholder operations requiring re-scheduling of operations to remediate. Possible action against the airport.	Significant disruption to stakeholder operations requiring executive intervention to resolve the issue. Breach of contractual obligations causing legal action to be taken against the airport
15	Environmental Regulatory Compliance # and severity of spills # regulatory violations	No impact	Environmental nuisance. No long term environmental damage. Insignificant risk of breaching environmental compliance.	Material short term environmental harm. Regulator warning received.	Event will cause environmental harm that requires immediate remediation works to be carried out. Regulatory violation incurred with possible fines.	Extreme violation of regulations. Environmental harm causes long term impacts on the environment. Fines enforced.

		Nil	Minor	Major	Critical	Extreme
Weighting	**Score**	**1**	**2**	**3**	**4**	**5**
	Type of Consequence					
15	**Health & Safety (staff, customers, public)**	No impact	Injury/illness requiring first aid and/or medical treatment on site.	Injury/illness resulting in compensable injury. Medical treatment required.	Fatality or permanent disability injury serious.	Multiple fatalities or work related diseases (not natural causes)
15	**Legal and Regulatory Compliance**	No impact	Minimal non-compliance to relevant legislation or regulatory code.	Non-compliance with legislation or regulatory code affecting landside or airside operations. Regulator warning received.	Major non-compliance with legislation or regulatory code. Regulatory notice received with possible fines.	Non-compliance with legislation or regulatory code affecting closure of core Airport operations or key business activities. Litigation imminent with the potential for class action.
10	**Aircraft Turnaround Times**	No impact	Minor disruption to airline schedules. Flight delayed < 30 mins	Major disruption to airline schedules. Flights delayed 30 mins – 1 hour	Major disruption to airline schedules. Flights delayed 1-4 hours.	Major disruption impacts airline schedules >4 hours
10	**Passenger Throughput Times (peak)** Asset failure impacts	No impact	Minor impact on passenger throughput time. (<15 mins)	Moderate impact on passenger throughput time. (15 – 30 mins)	Major impact on passenger throughput time (30 - 45 mins)	Extreme impact on passenger throughput time (>45 mins)

		Nil	Minor	Major	Critical	Extreme
Weighting	Score	1	2	3	4	5
	Type of Consequence					
	security system, vertical transportation, aircraft turnaround.					
10	Loss of service impact	No Impact	Impact to concessions and other airport businesses <1 hour.	Significant impact resulting in loss of sales or ability to carry out business. > 4 hours	Significant impact resulting in loss of sales or ability to carry out business > 8 hours	Significant impact resulting in loss of sales or ability to carry out business > 24 hours
10	Airport Credibility	No Impact	10-20 customer complaints	Reported on local media	Reported on national media	Intervention required by CEO.

Tolerability

- Which consequences aren't tolerable?
- Are Business Continuity Plans in place?
- Do maintenance strategies manage critical assets?
  - Run To Failure
  - Condition Based Maintenance
  - Schedule Based Maintenance
  - Design Change
- Does Renewal timing reduce failure of high risk assets?

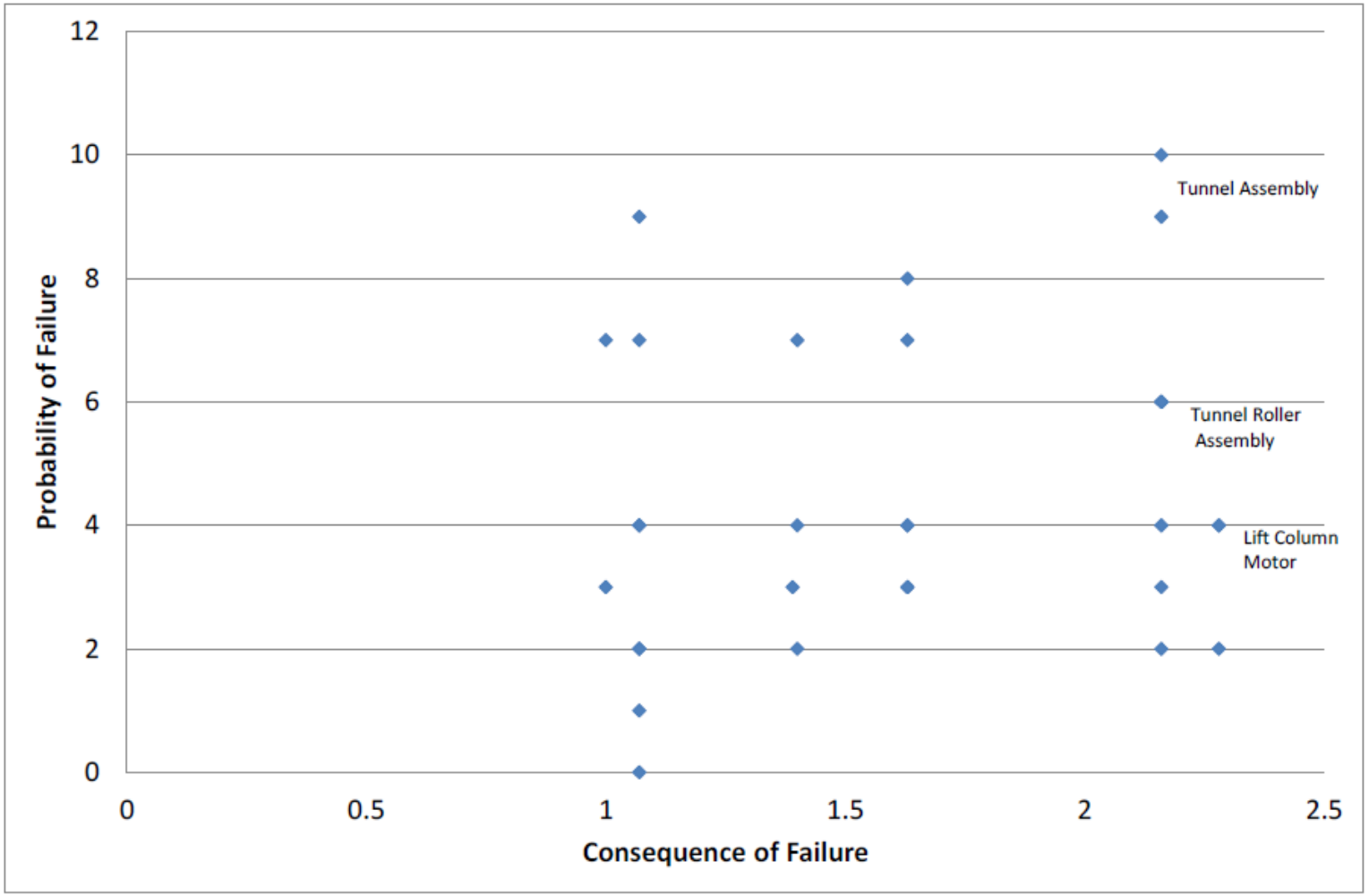
Critical Assets – Passenger Boarding Bridge

Figure 28 Consequence of Failure Assessment

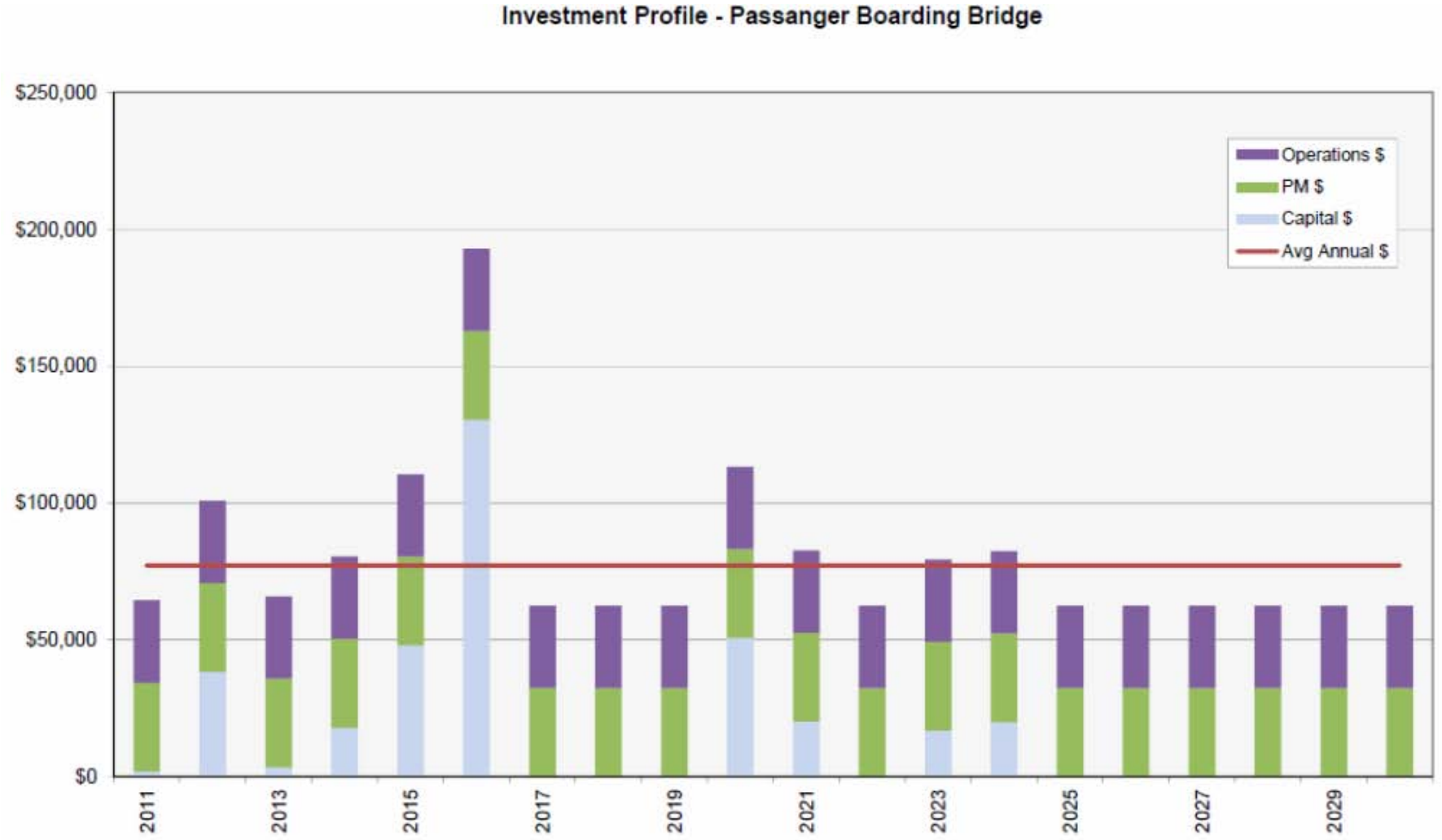
Asset Register and Hierarchy				Probability of Failure	Loss of Service Impact	Public Health & Safety	Airport Credibility	Cost of Failure (Restoration Cost)	Resource and Operational Impacts	Level of Service Impact	Regulatory Violations, Air/Water/Land Contamination
Current Year	2011			Rating	0.35	0.5	0.15	0.2	0.3	0.5	1
Level 1	Level 2	Level 3	Level 4	Calculated	Tab C	Tab C	Tab C	Tab C	Tab C	Tab C	Tab C
1 - Gate	-11 Gate 1 PBB	-111PC Air	-1111 Air Hose	0	1.5	1	1	1	1	1	1
			-1112 Condenser	1	1.5	1	1	1	1	1	1
			-1113 Compressor	2	1.5	1	1	1	1	1	1
		-112 400 Hz Power	-1121 Cord	2	1.5	1.5	1.5	1	1	1.5	1.5
			-1122 Plug	7	1.5	1.5	1.5	1	1	1.5	1.5
			-1123 Retractor/Cable Hoist	4	1.5	1.5	1.5	1	1	1.5	1.5
		-113 Potable Water	-1131 Cabinet	4	1.5	1	1	1	1	1	1
			-1132 Hose	2	1.5	1	1	1	1	1	1
		-114 Interiors	-1141 Wall covering	9	1.5	1	1	1	1	1	1
			-1142 Carpet	7	1.5	1	1	1	1	1	1
			-1143 Hand rails	4	1.5	1	1	1	1	1	1
		-115 Rotunda	-1151 Bearings	4	2	1.5	1.5	1	1.5	2	1.5
			-1152 Curtain	3	2	1.5	1.5	1	1.5	2	1.5
			-1153 Base Column	4	2	1.5	1.5	1	1.5	2	1.5
		-116 Pedestal		3	2	2	2	1.5	2	3	2
		-117 Tunnel assembly	-1171 Tunnel Assemblies	9	2	2	2	1.5	2	3	2
			-1172 Tunnel Roller Assemblies	6	2	2	2	1.5	2	3	2
		-118 Wheel Bogie	-1181 Assembly	6	2	2	2	1.5	2	3	2
			-1182 Wheel	2	2	2	2	1.5	2	3	2
			-1183 Tire Pneumatic	10	2	2	2	1.5	2	3	2
			-1184 Wheel Motor DC Drive	2	2	2	2	1.5	3	3	2
			-1185 Wheel Motor AC Drive	4	2	2	2	1.5	3	3	2
			-1186 Tire Solid	6	2	2	2	1.5	2	3	2
		-119 Lift Column	-1191 Lift Column Motors	4	2	2	2	1.5	3	3	2
			-1192 Lift Column Ball Screws	4	2	2	2	1.5	2	3	2
		-120 Cab Assembly		8	2	1.5	1.5	1	1.5	2	1.5
		-121 Cab Curtain		3	2	1.5	1.5	1	1.5	2	1.5
		-122 Cab Bumper		7	2	1.5	1.5	1	1.5	2	1.5
		-123 Stairs		7	1	1	1	1	1	1	1
		-124 Bag chute		3	1	1	1.5	1	1.5	2	1.5
		-125 Use/power meter		3	1	1	1	1	1	1	1

Critical Assets – Risk Plot

Figure 29 Business Risk Exposure Plot



Renewal and Maintenance Forecast



Asset Management Evolution ...

Asset

- Maintenance management
- Run, monitor, replace

Strategy

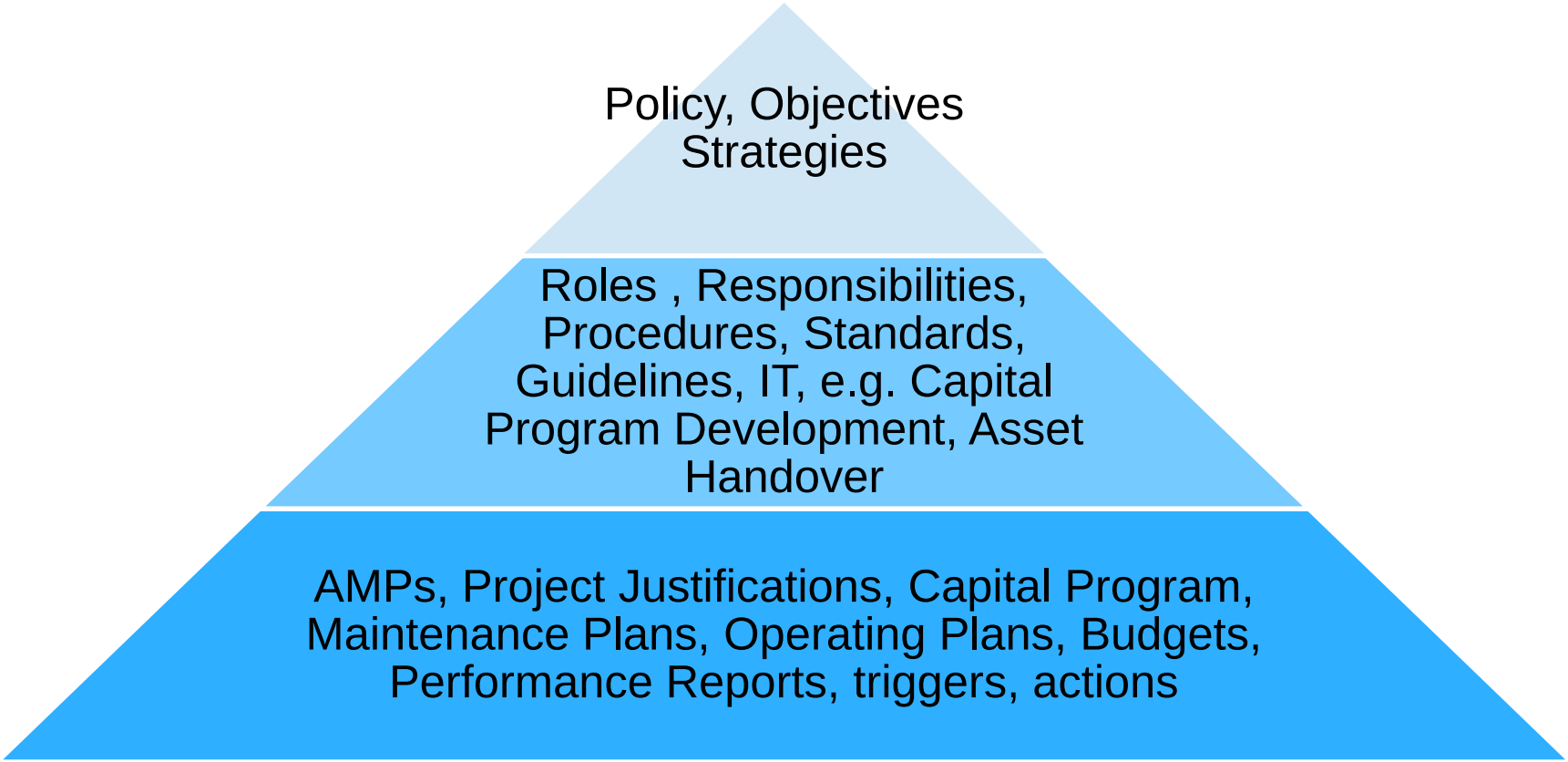
- Renewal planning
- Optimized Capital, Operations, Maintenance

Enablers

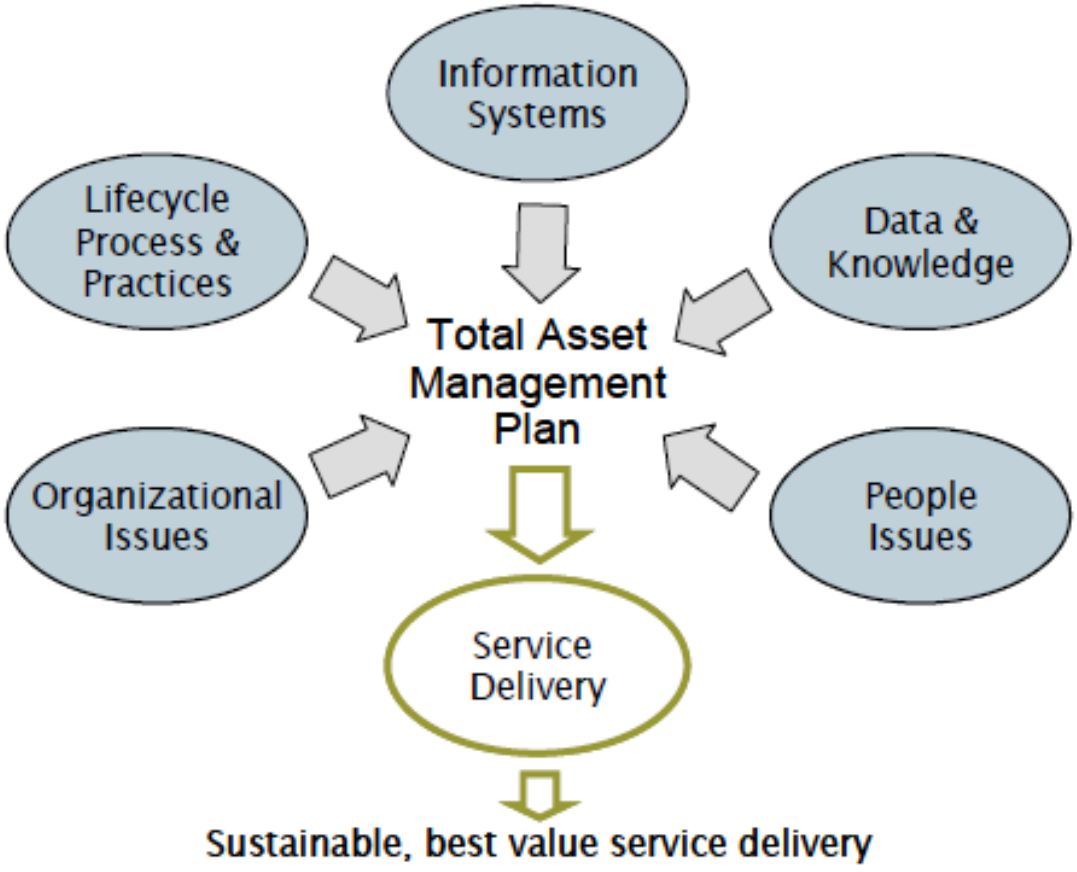
- Systems, processes, procedures,
- Competencies, organization function, roles, responsibilities, accountabilities, vision, leadership, change management, continuous improvement processes

PAS 55 - ISO 55000 Series (2013)

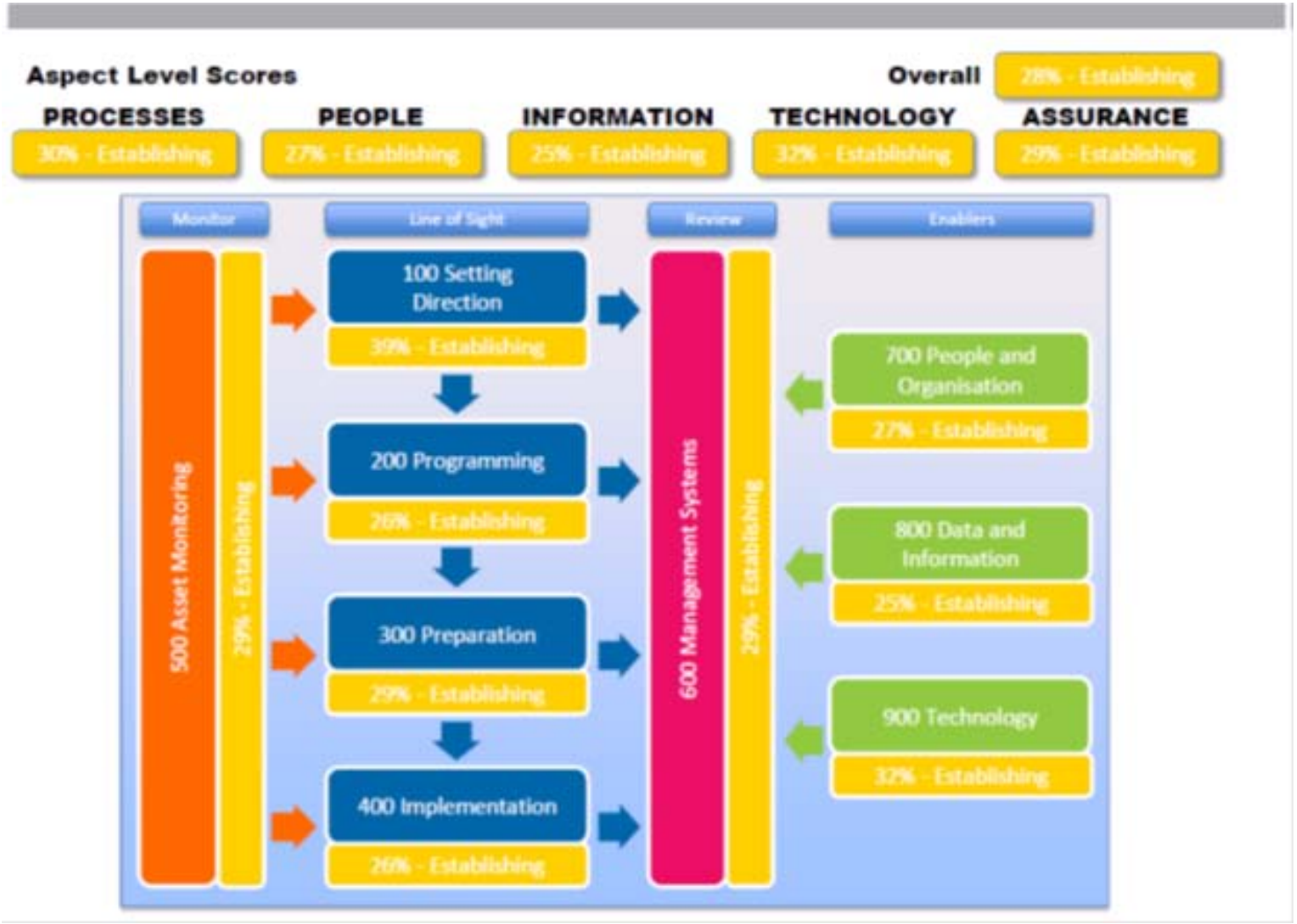
Implementation



Identifying Improvements and Managing Change

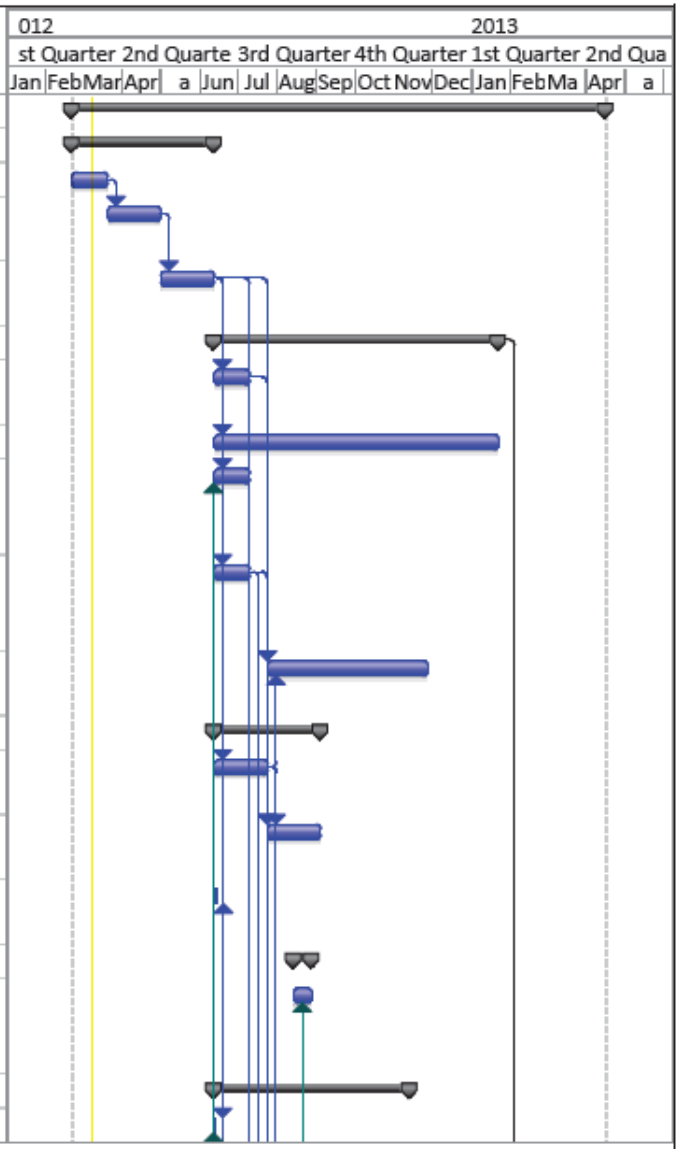


PAS 55:2008 Gap Assessment



Implementation Plan

ID	Task Name
1	**BAC Asset Management Improvement Program**
2	**100 Setting Direction**
3	100.1 Develop a corporate AM Policy for adoption by the CEO and Board
4	100.2 Establish AM Objectives and Targets
5	100.3 Document Corporate AM strategy including outline of all processes, procedures and guidelines for the consistent application of AM
6	**200 Programming**
7	200.1 Document Procedure for the Capture, develop and maintenance of asset replacement cost information
8	200.2 Develop policy guidance for condition information capture and utilisation
9	200.3 Establish procedures for Life Cycle Cost capture - capital, maintenance and operating
10	200.4. Formalise asset operational risk management policy and procedures including guideline on risk assessment and tolerability, roles and responsibilities for management.
11	200.5 Review capital project evaluation policies and procedures
12	**300 Preparation**
13	300.1 Establish a Levels of Service Statement and reporting framework
14	300.2 . Formalise Asset Management Plan development and update procedures and guidelines
15	300.3 Revise maintenance contracts according to recommendations from AMPs and from Maintenance Function review
16	**400 Implementation**
17	400.4. Formalise process and responsibilities for AMP implementation - capital progrm development, budgeting, process improvement and maintenance strategy and contract modifications.
18	**500 Asset Monitoring**
19	500.1 Implement functionality in Maximo to capture and update condition ratings



Benefits

Julieanne Alroe, CEO of Brisbane Airport, Australia,

“One of the greatest benefits of asset management has been the ability to provide information to the Board on infrastructure capabilities and future needs – this type of knowledge is invaluable and is essential for making the best, justified investment decisions”

GHD

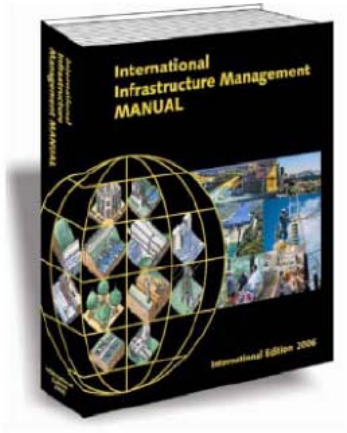
- 6,000 professionals
- World's top 50 global design firms (ENR)
- Markets and Services:
  - Transportation
    - Transport economics & logistics
    - Aviation
    - Marine
    - Rail, roads & highways, bridges
  - Energy and resources
  - Environment
  - Property and buildings
  - Water

Where are we?


Canada
India
UK
China
USA
Vietnam
Philippines
Malaysia
Papua New Guinea
Qatar
Indonesia
UAE
Chile
Australia
New Zealand

GHD Asset Management - Leadership

- Original authors of the International Infrastructure Management Manual
- Authors and providers of training on Advanced Asset Management for the US EPA
- Review role for PAS55 Publicly Available specification for Optimization of Physical Assets
- Technical Advisory Group for ISO55000 series on Asset Management



www.ghd.com

Definition

Asset Management is defined by PAS 55 as:

"Systematic and coordinated activities and practices through which an organization optimally and sustainably manages its assets and asset systems, their associated performance, risks, and expenditures over their life cycles for the purposes of achieving its organizational strategic plan"

An organizational strategic plan is defined as:

Overall long-term plan for the organization that is derived from, and embodies its vision, mission, values, business policies, stakeholder requirements, objectives and the management of its risks."