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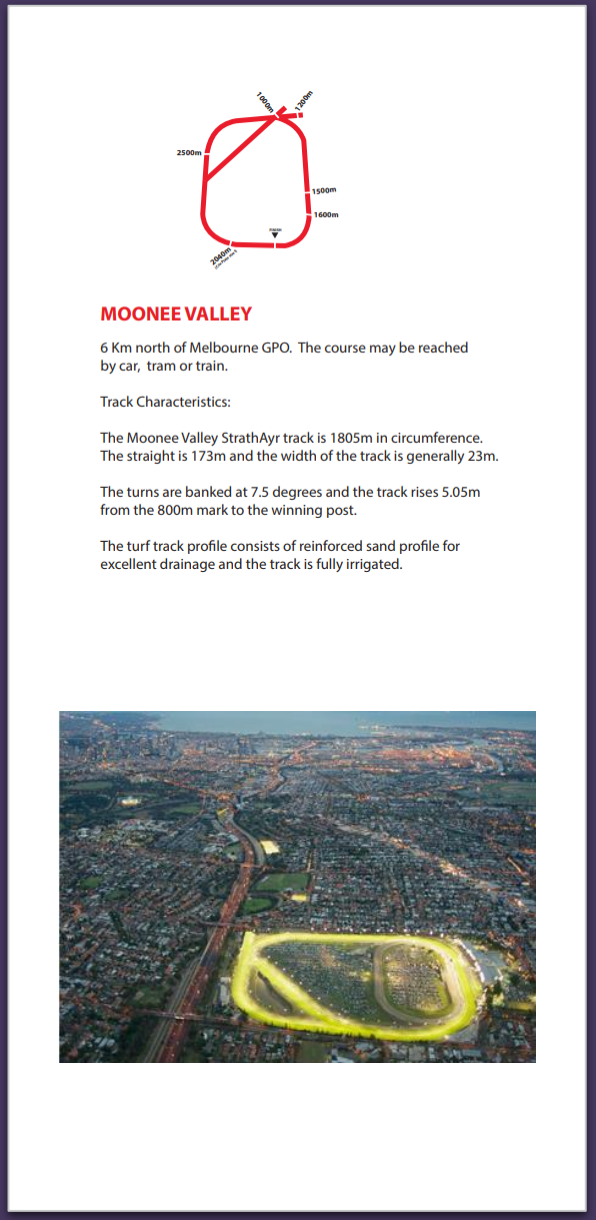
Stormwater Treatment, Harvest, and Reuse: A Winning Trifecta at Moonee Valley

June 2019



Track map and description

Presentation overview

Background
Information about the unique opportunities and challenges that exist at Moonee Valley Racecourse.

Stormwater Concept
The concept for the stormwater system to achieve the required outcomes while benefitting downstream systems.

Technical Investigations
Geeky stormwater details from the conceptual investigation.

Current Status
Mid-race update on the status of the project.

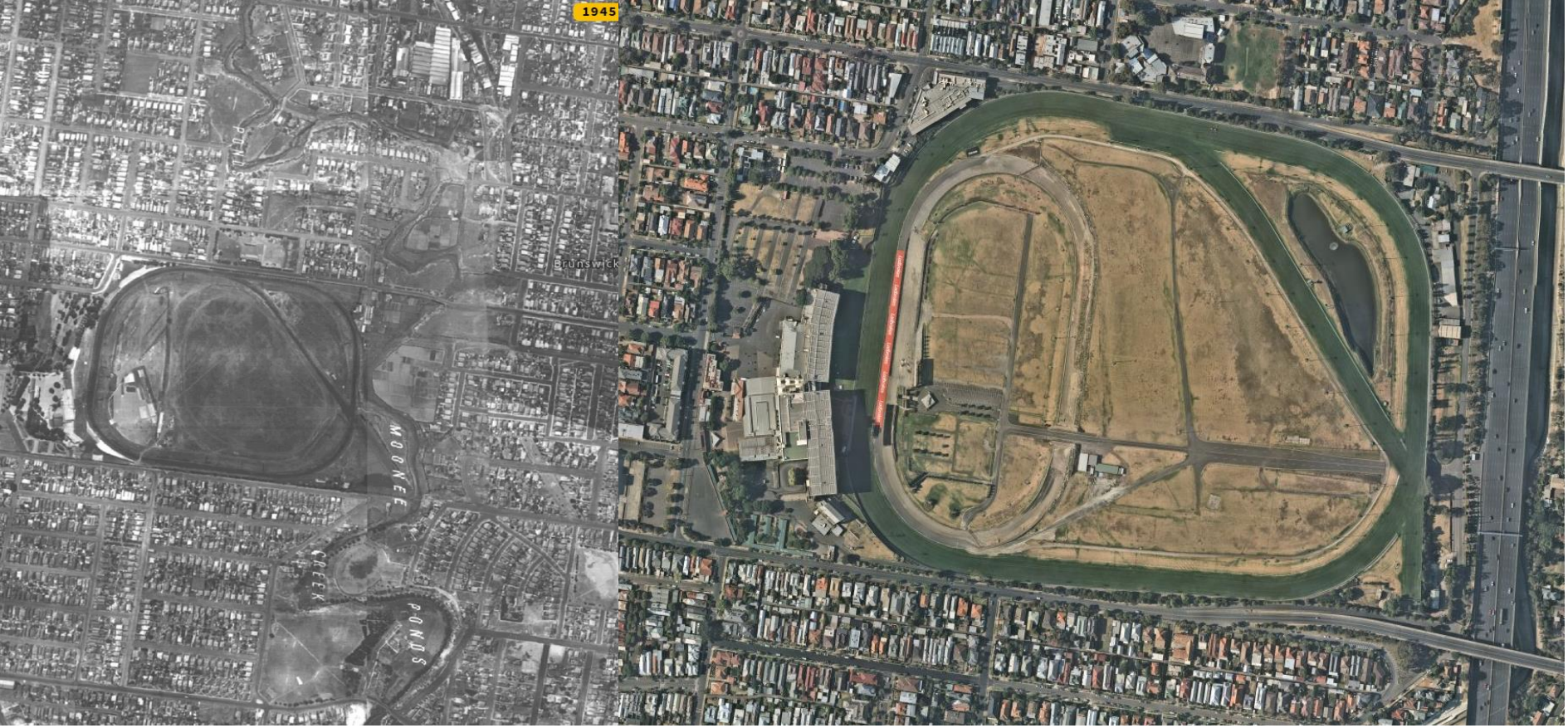
Background

Understanding MVRC

Moonee Valley

Today's context

- One of two racecourses in Melbourne 6 km from the CBD.
- The W. S. Cox Plate is the highest-profile event of the year. The 2,040 m distance has been maintained.
- Inner-city location and compact track makes night racing a key feature.



Moonee Valley Racecourse

A brief history

- MVRC established circa 1883. (Private entity, not Crown Land)
- Moonee Ponds Creek ran through the MVRC site pre-1883. Check out the image to see how close the Creek was to the track as late as 1945.
- Moonee Ponds Creek was channelised in the 1950s and 1960s.
- City Link construction commenced in 1996. Moonee Ponds Creek was moved, and MVRC got smaller.
- Image credit: https://1945.melbourne (Check it out after the presentation!)


Ladbrokes Ladbrokes Ladbrokes Ladbrokes Ladbrokes

Let’s talk about…turf

Why MVRC has always managed urban stormwater

The track manager

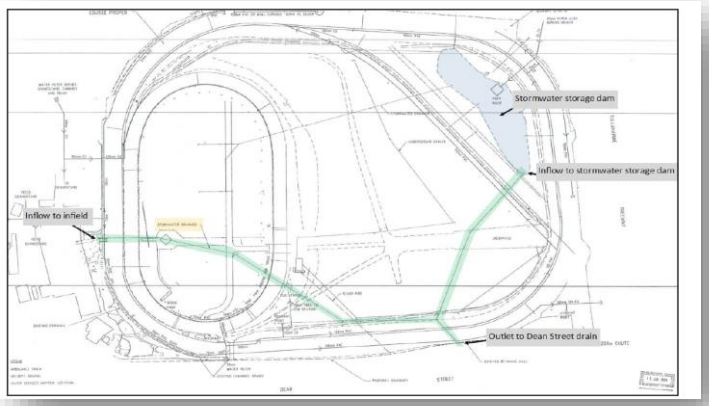
Not all (stormwater) heroes wear capes

How do you irrigate a racecourse in Melbourne through drought?

- Construct the stormwater storage dam—25 ML
- Utilise the municipal stormwater system to harvest water
- Develop practical solutions to make it work

The Good:

- Limits urban runoff to Moonee Ponds Creek
- Uses urban stormwater as a resource
- Maintenance of the whole system by the club
- Smart water fund (City West Water)



When you get rain each week, it is pretty easy. But, when you have to make that decision [to irrigate] on your own, and it all comes down to wind, irrigation, all that, that's what has the biggest impact on this track.

MVRC Track Manager Martin Symon interviewed by Turfmate.com.au


Ladbrokes

Handicapped by aging infrastructure

Make do and mend, stormwater-style

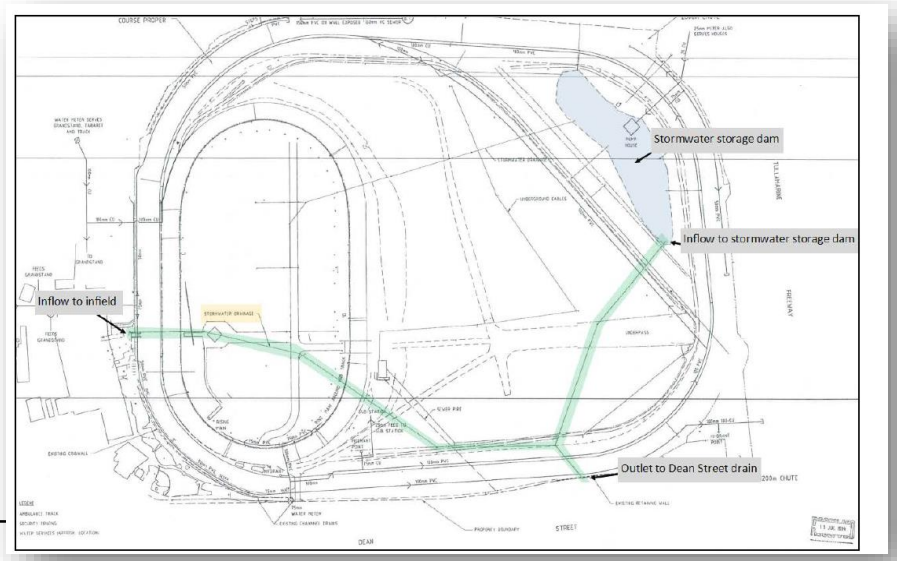



The Not-so good:

- Stormwater harvest infrastructure is ad-hoc
- Certain components of the stormwater system are in disrepair
- The existing infrastructure is not really to *a* standard, much less to today's stormwater infrastructure standards.

The (pretty) ugly:

- Batter slopes are crumbling
- Algae blooms



Enter, opportunity

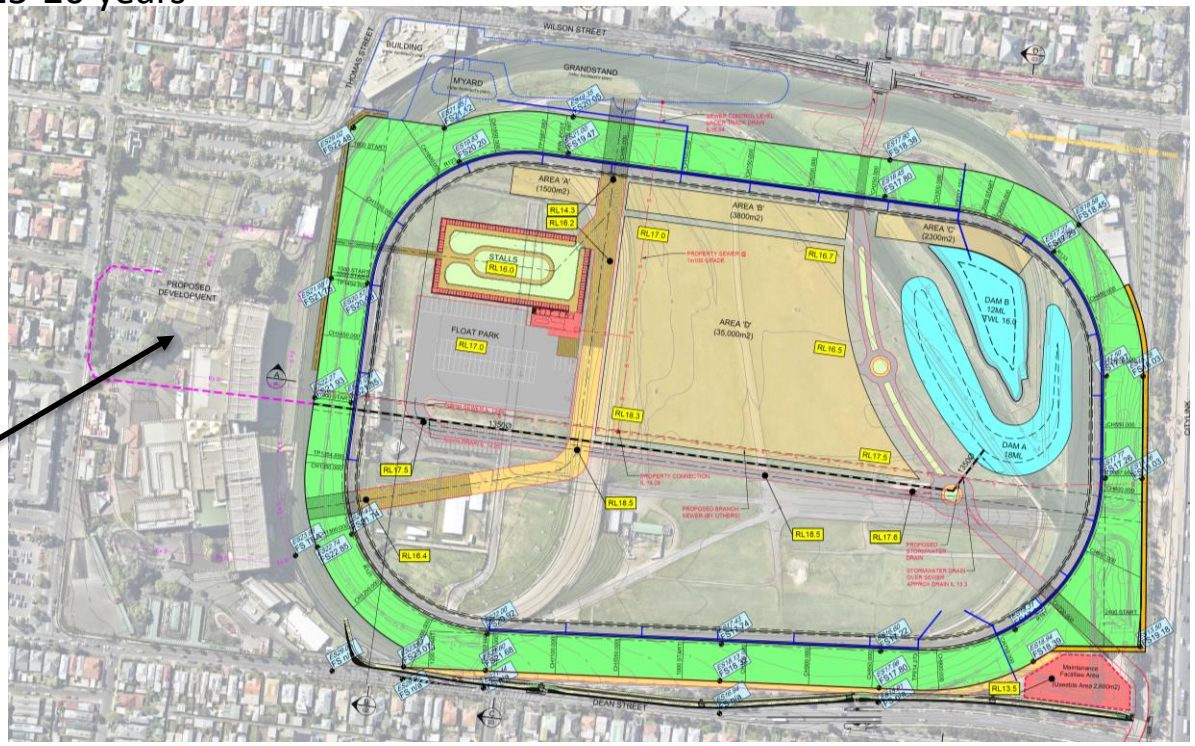
The Valley of Tomorrow

In 2009, MVRC announced its intention to redevelop the racecourse.

- 39 ha for the racecourse, grandstand, etc.
- 9 ha for a ‘mixed-use precinct’ (joint venture with Hostplus-Hamton as of 2017)
- Estimated time span: 15-20 years

DCE is part of the development team.

Our scope is the redevelopment of the course proper and infield.

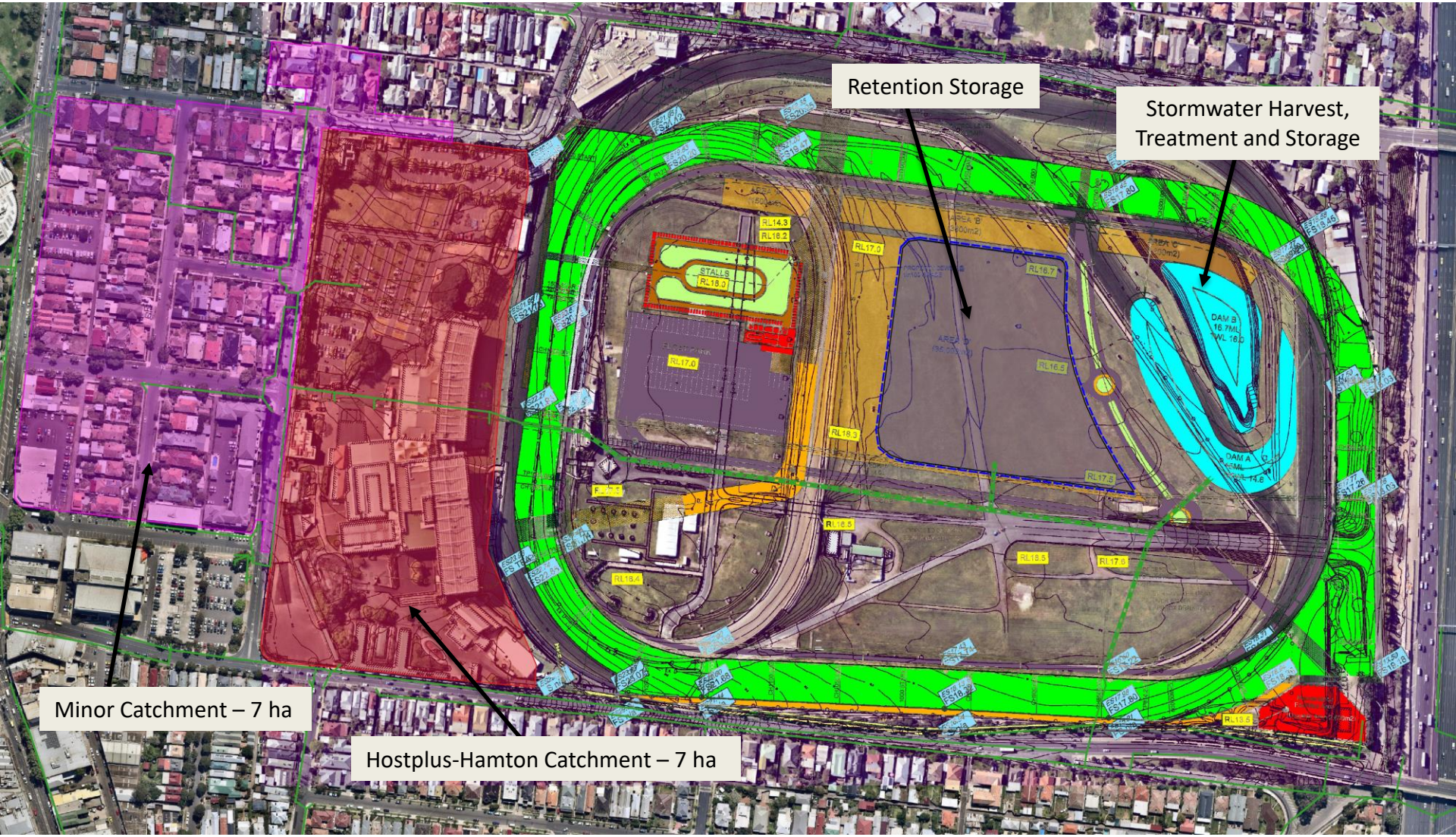


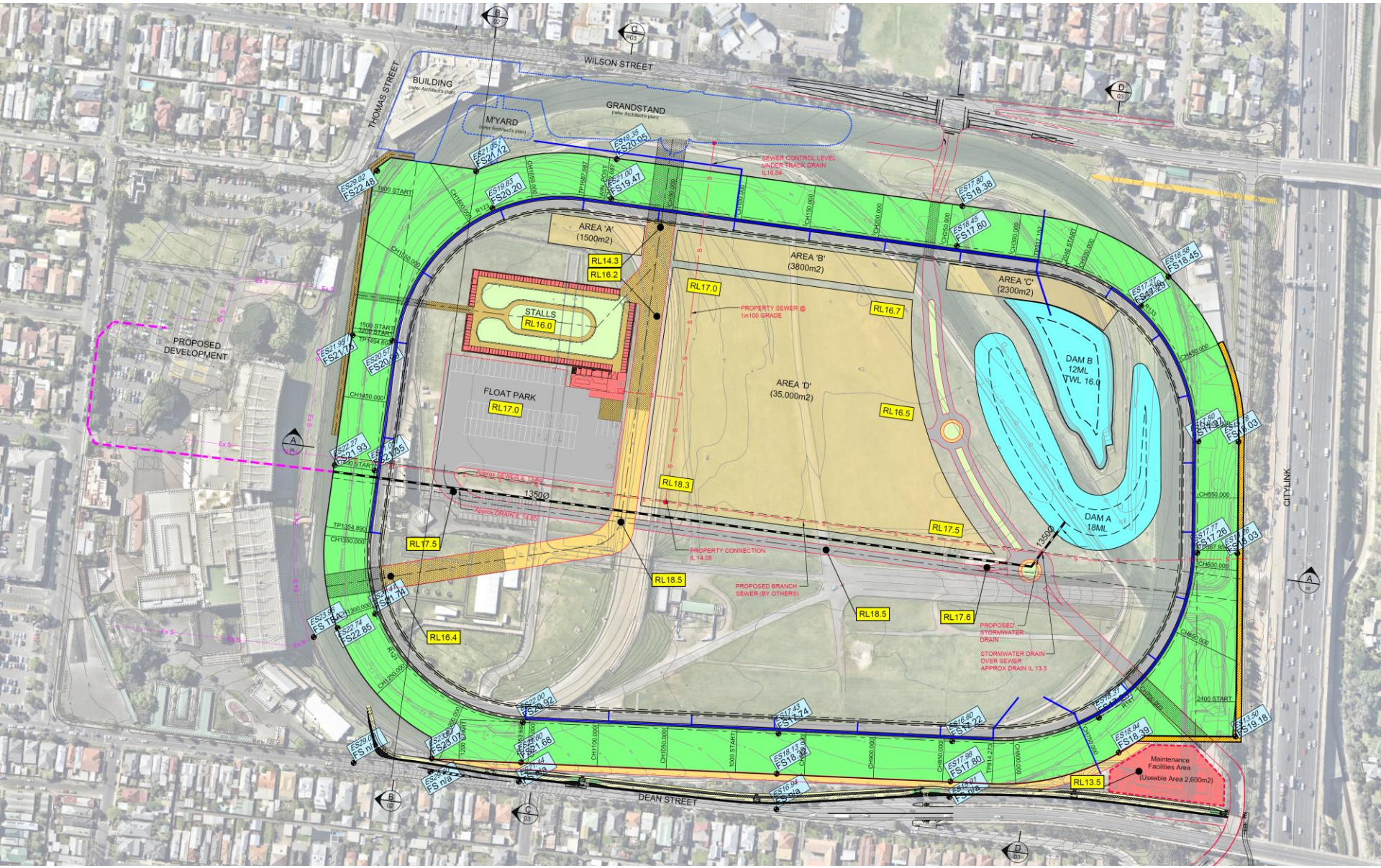
Stormwater Concept

Dream big

Stormwater concept

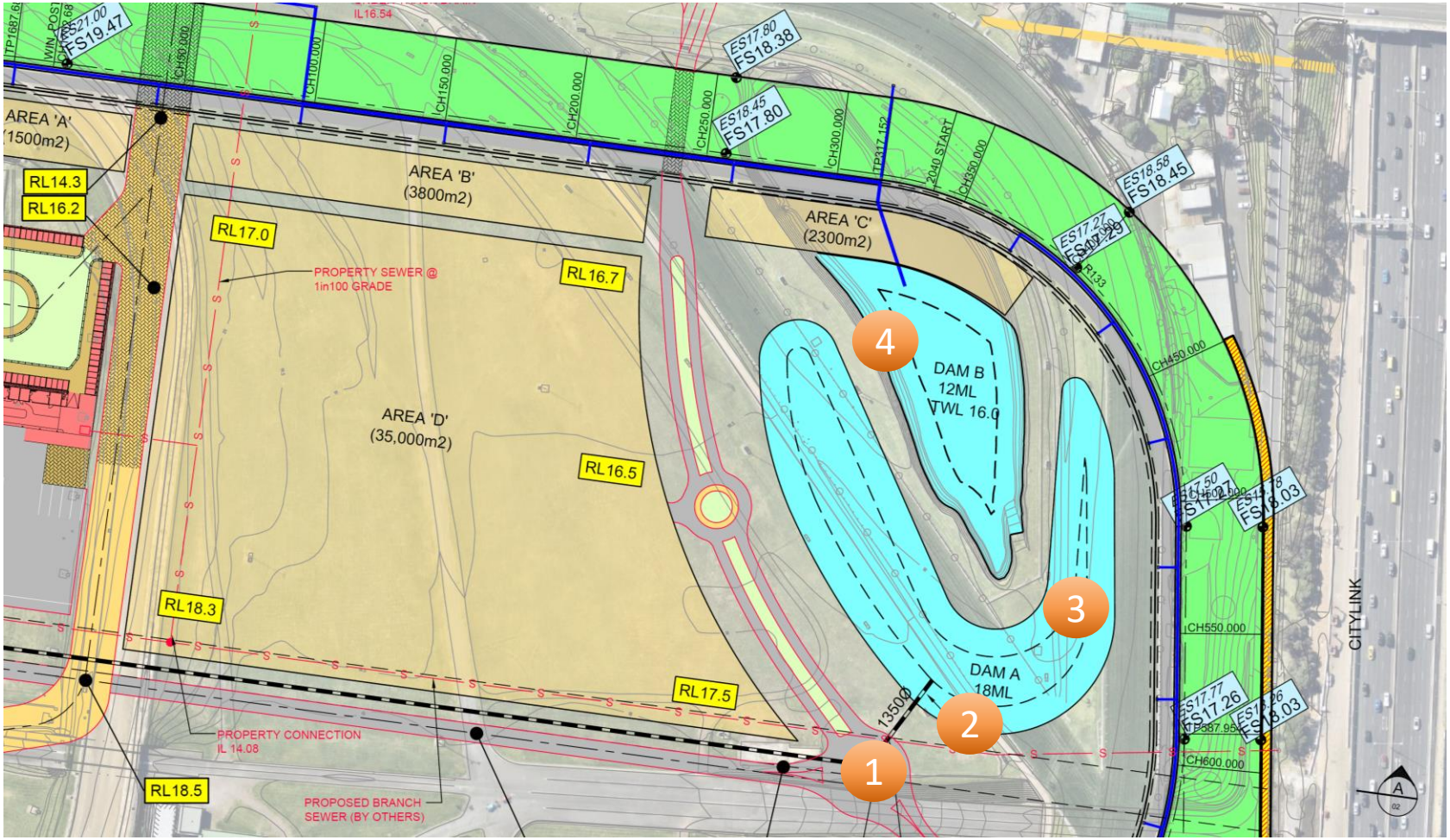
Stormwater harvest, treatment, and reuse




WILSON STREET
THOMAS STREET
BUILDING
(refer Architect's plan)
GRANDSTAND
(refer Architect's plan)
M'YARD
(refer Architect's plan)
SEWER CONTROL LEVEL UNDER TRACK DRAIN IL16.54
AREA 'A'
(1500m2)
AREA 'B'
(3800m2)
AREA 'C'
(2300m2)
AREA 'D'
(35,000m2)
STALLS
RL16.0
FLOAT PARK
RL17.0
PROPERTY SEWER @ 1in100 GRADE
DAM B
12ML
TWL 16.0
DAM A
18ML
PROPOSED DEVELOPMENT
1350Ø
PROPERTY CONNECTION IL 14.08
PROPOSED BRANCH SEWER (BY OTHERS)
PROPOSED STORMWATER DRAIN
STORMWATER DRAIN OVER SEWER APPROX DRAIN IL 13.3
Maintenance Facilities Area
(Useable Area 2,600m2)
DEAN STREET
CITYLINK
RL14.3
RL16.2
RL16.7
RL16.5
RL18.3
RL17.5
RL18.5
RL17.6
RL16.4
RL13.5

Stormwater Quality Treatment

Horses for Courses



Technical Investigations

Get your geek on

Stormwater Harvest

All for one and one for turf

Estimate existing SWH catchment as a fraction of the (defined) redeveloped SWH catchment!

- The goal: Define existing and redeveloped stormwater reuse reliability
- The method: Simulate stormwater harvests (existing and redeveloped) in MUSIC
- Some challenges:
    - Existing stormwater harvest catchment is undefined.
    - Existing stormwater demand is not (well) defined.
- Modelling inputs:
    - Melbourne rainfall data—similar rainfall (when compared to local gauges) but with way more years of record.
    - Stormwater storage volume based on existing 25-ML dam and redeveloped 30-ML total storage
    - Seasonality of stormwater demand
        - January to February - highest irrigation demand
        - April to October - minimal irrigation demand
        - ASSUME: irrigation demand pattern maintained even after redeveloped track surface area increases!

Stormwater Harvest

All for one and one for turf

Estimate current demand—but how?

1. Anecdotal usage: water the track with 6 mm after each race meeting, and follow up with 16 mm over the weekend
2. Average monthly irrigation consumption from 2017 and part of 2018 (from the Track Manager)
3. Use the monthly irrigation total (in mm) from the Track Manager and apply it to the surface of the existing course proper.

Method		Annual demand (kL/year)
1	Anecdotal	23,000
2	Average monthly (kL)	45,000
2	Total monthly (mm)	67,200

Bit of a difference! How do we pick an actual demand?

Fun facts: There's just over 4 ha of turf in the existing course proper at MVRC. This is equivalent to 2.5x the grassed area of the MCG!

Redeveloped MVRC will have over 5 ha of turf in the course proper. This is equivalent to almost 3x the grassed area of the MCG!

Stormwater Harvest

25 pictures are worth a thousand data points

Current stormwater harvest is related to the stormwater harvest catchment. What do we have? A lot of aerial imagery of the storage dam. Can we calibrate a MUSIC model to a bunch of pictures? Why the heck not?

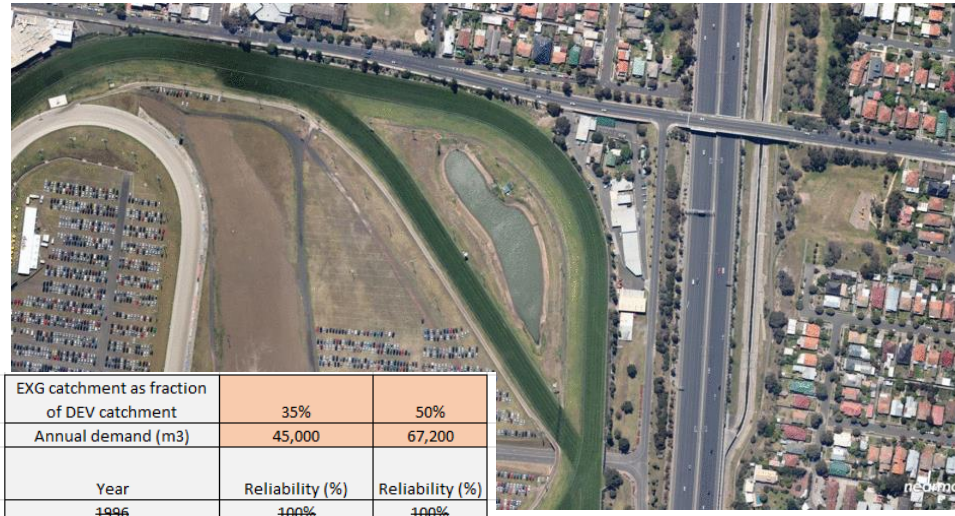
Method		EXISTING Annual demand (kL/year)
1	Anecdotal	23,000
2	Average monthly (kL)	45,000
2	Total monthly (mm)	67,200

Both 45,000 kL per year and 67,200 kL per year seem plausible.

Stormwater Harvest

20 pictures are worth a thousand data points

		50%		35%	
		67,200		45,000	
Date	Estimated volume (m^3)	MUSIC volume (m^3)	*Difference*	MUSIC volume (m^3)	*Difference*
15-11-00	13,644	25,600	*11,956*	26,200	*12,556*
18-11-00	13,852	24,900	*11,048*	25,700	*11,848*
19-02-01	10,040	0	*-10,040*	4,970	*-5,070*
20-06-01	15,134	25,700	*10,566*	17,900	*2,766*
04-07-01	16,295	25,800	*9,505*	18,100	*1,805*
29-04-02	12,826	880	*-11,946*	601	*-12,225*
29-05-02	14,866	2,650	*-12,216*	1,840	*-13,026*
11-10-02	5,557	5,380	*-177*	3,470	*-2,087*
11-11-03	1,879	17,900	*16,021*	12,100	*10,221*
11-12-03	2,416	15,900	*13,484*	10,600	*8,184*
04-03-04	4,732	0	*-4,732*	0	*-4,732*
12-11-04	12,886	27,500	*14,614*	26,900	*14,014*
19-01-06	0	15,500	*15,500*	18,800	*18,800*
04-03-06	3,490	8,690	*5,200*	14,200	*10,710*
11-11-06	376	8,840	*8,464*	13,800	*13,424*
30-06-09	2,248	0	*-2,248*	0	*-2,248*
12-10-09	7,812	9,360	*1,548*	6,250	*-1,562*
06-11-09	11,490	7,770	*-3,720*	5,000	*-6,490*
13-11-09	4,309	5,790	*1,481*	3,590	*-719*
07-01-10	19,329	11,500	*-7,829*	7,480	*-11,849*
01-02-10	6,477	819	*-5,658*	26	*-6,450*
20-02-10	10,161	930	*-9,231*	686	*-9,475*
16-04-10	15,181	2,430	*-12,751*	1,690	*-13,491*
21-06-10	15,181	1,670	*-13,511*	1,190	*-13,991*
11-07-10	15,181	2,500	*-12,681*	1,750	*-13,431*
			12,647		***-12,519***



EXG catchment as fraction of DEV catchment	35%	50%
Annual demand (m3)	45,000	67,200
Year	Reliability (%)	Reliability (%)
~~1996~~	~~100%~~	~~100%~~
1997	85%	71%
1998	73%	73%
1999	80%	81%
2000	100%	100%
2001	98%	81%
2002	87%	80%
2003	53%	53%
2004	77%	78%
2005	100%	100%
2006	100%	96%
2007	69%	59%
2008	68%	69%
2009	55%	56%
2010	85%	87%
AVERAGE	81%	77%

An existing SWH catchment 50-35% of the redeveloped SWH catchment is likely.

Stormwater Harvest

What can MVRC expect from the new system?

Estimates of future reliability based on:

- Annual demands (some confidence in two of them)
- Increased course proper area of 51,060 sq. m → Increased demands:

Method		REDEVELOPED Annual demand (kL/year)
~~1~~	~~Anecdotal~~	~~30,000~~
2	Average monthly (kL)	51,000
3	Total monthly (mm)	84,200

Storage volume (m^3)	31,000		
Annual demand (m^3)	84,000		
Year	Potable top-up (m^3/year)	Potable cost ($/year)	Reliability (%)
~~1996~~	0	$0	~~100%~~
1997	20,047	$57,735	76%
1998	0	$0	100%
1999	0	$0	100%
2000	0	$0	100%
2001	14,389	$41,440	83%
2002	0	$0	100%
2003	28,358	$81,670	66%
2004	1,835	$5,285	98%
2005	0	$0	100%
2006	0	$0	100%
2007	16,488	$47,486	80%
2008	2,599	$7,485	97%
2009	9,791	$28,199	88%
2010	0	$0	100%
AVERAGE	6,679	$19,236	92%
Average excl. 100%	13,358	$38,471	n/a

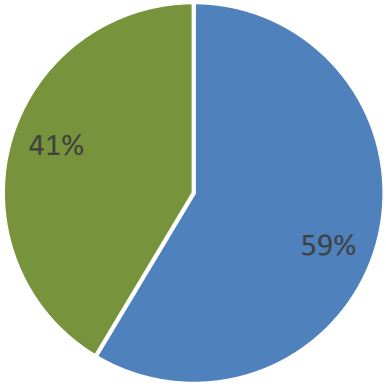
Redeveloped SWH assessed for the millennium drought years (1996-2010) to estimate

- Reliability
- Potable top-up (volume and cost) ($2.88/kL City West Water)
- Outflow to Moonee Ponds Creek

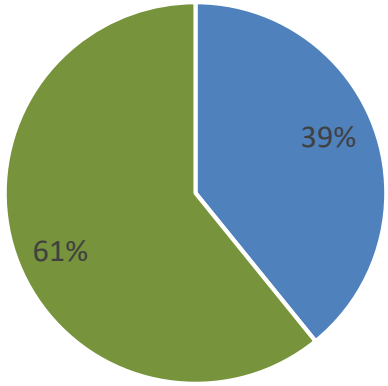
Stormwater Reuse

What's not going into Moonee Ponds Creek?

Water Balance – Higher Demand



Water Balance – Lower Demand



Annual irrigation demand (m^3/year)	**84,000**	**51,000**
AVERAGE annual outflow (1900-2010) (m^3/year)	64,000	93,000

Rounding the turn for home

Current status

Finishing Post

If you’re not first, you’re last

The redevelopment project at MVRC is serving as a catalyst for overhauling the stormwater system and bringing it into the 21st century. The upgrades to the racecourse and its stormwater system will make holding race meets and other community events at MVRC viable into the future. The race meets pay for the upkeep of the stormwater system, and the dedicated facilities crew at Moonee Valley can keep a close eye on the system.

Climate is cyclical an there will be another 10 years or drought. The stormwater system at MVRC is going to ensure that there is irrigated vegetation—critical for providing urban cooling within a fairly densely developed urban area. The stormwater harvest system reduces the need for MVRC to buy potable water, ensuring that potable water is available for potable uses.

Climate is cyclical, and if the next drought is anything like the millennial drought, it will end with some seriously wet years. The stormwater system at MVRC will limit developed, urban stormwater from entering a constrained waterway.

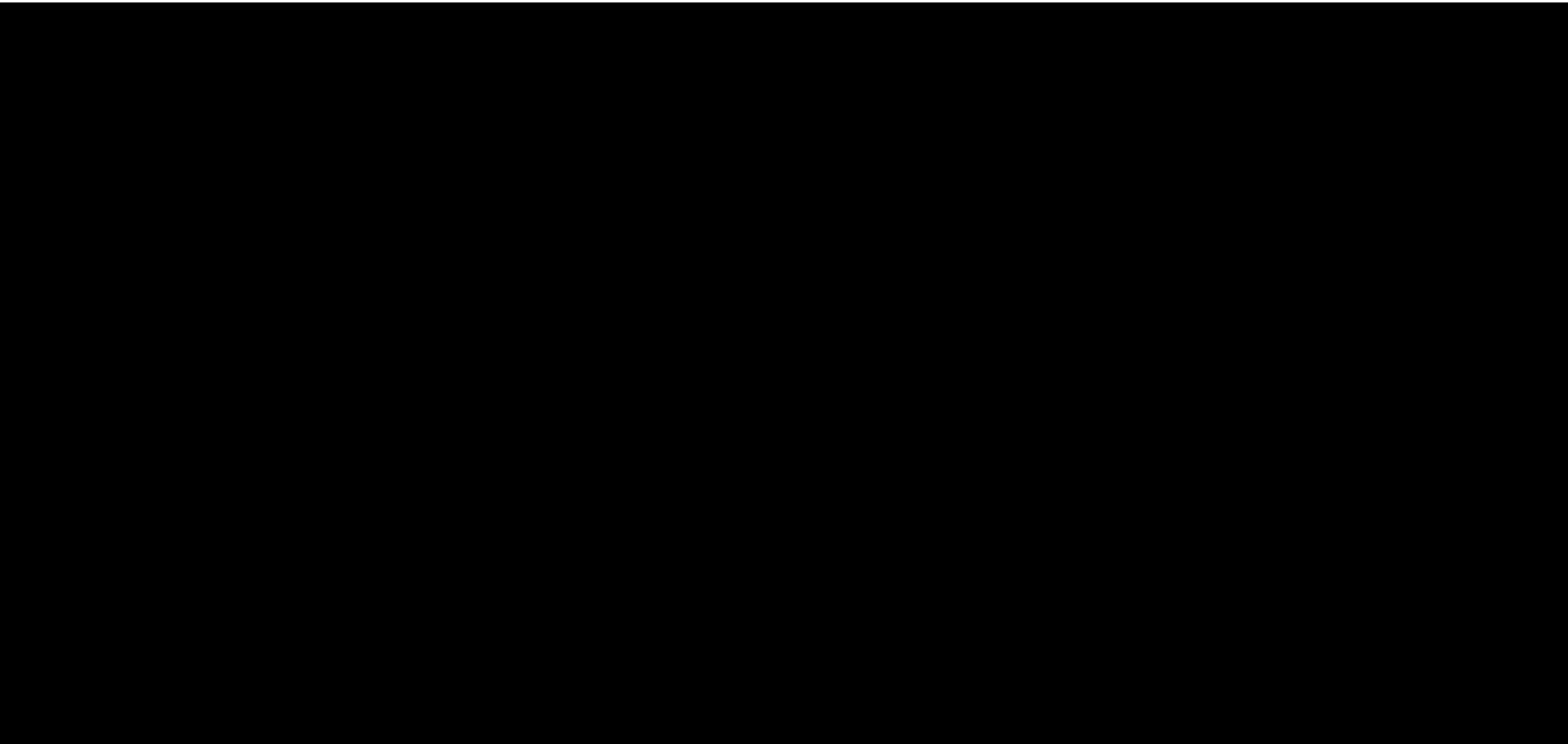
The overflow detention system provides emergency storage to reduce the strain on the council network and Dean Street.

First past the post

If you’re not first, you’re last

Innovation, adaptation and practical solutions have always been key to the success and viability of MVRC.

MVRC’s natural resilience combined with the ambitious stormwater system is a winning combination and will support the club’s vision of the Valley of the Future.



Combining the civil engineering imperatives for sporting facilities with the necessary infrastructure expertise.

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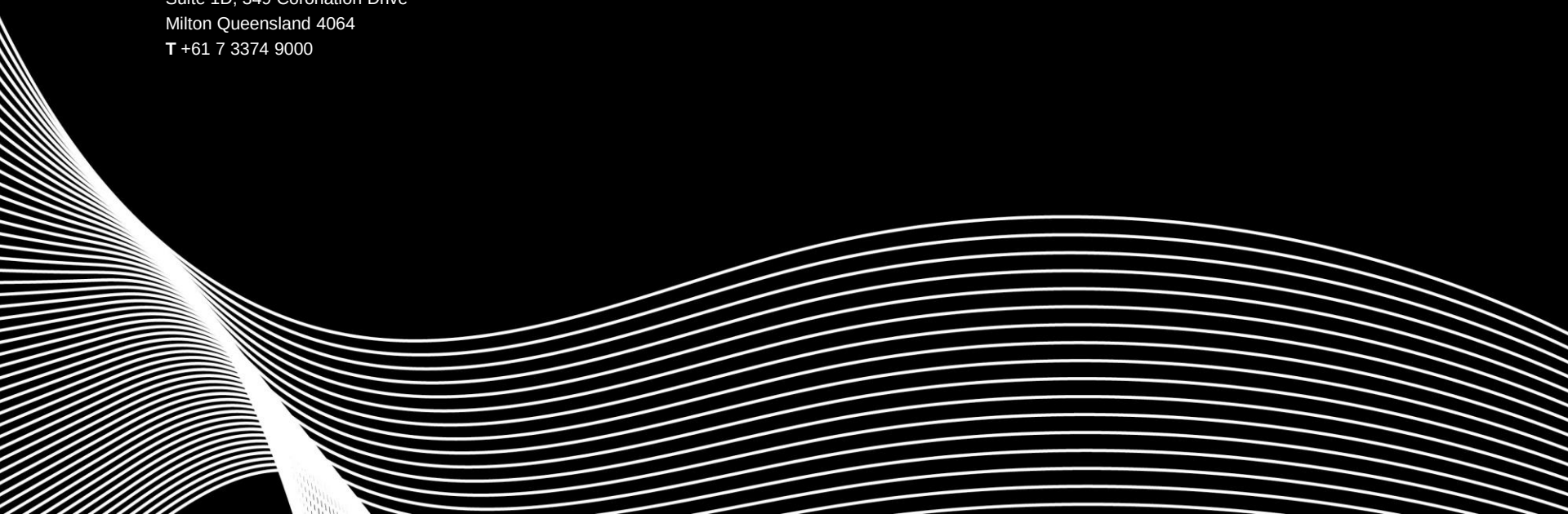


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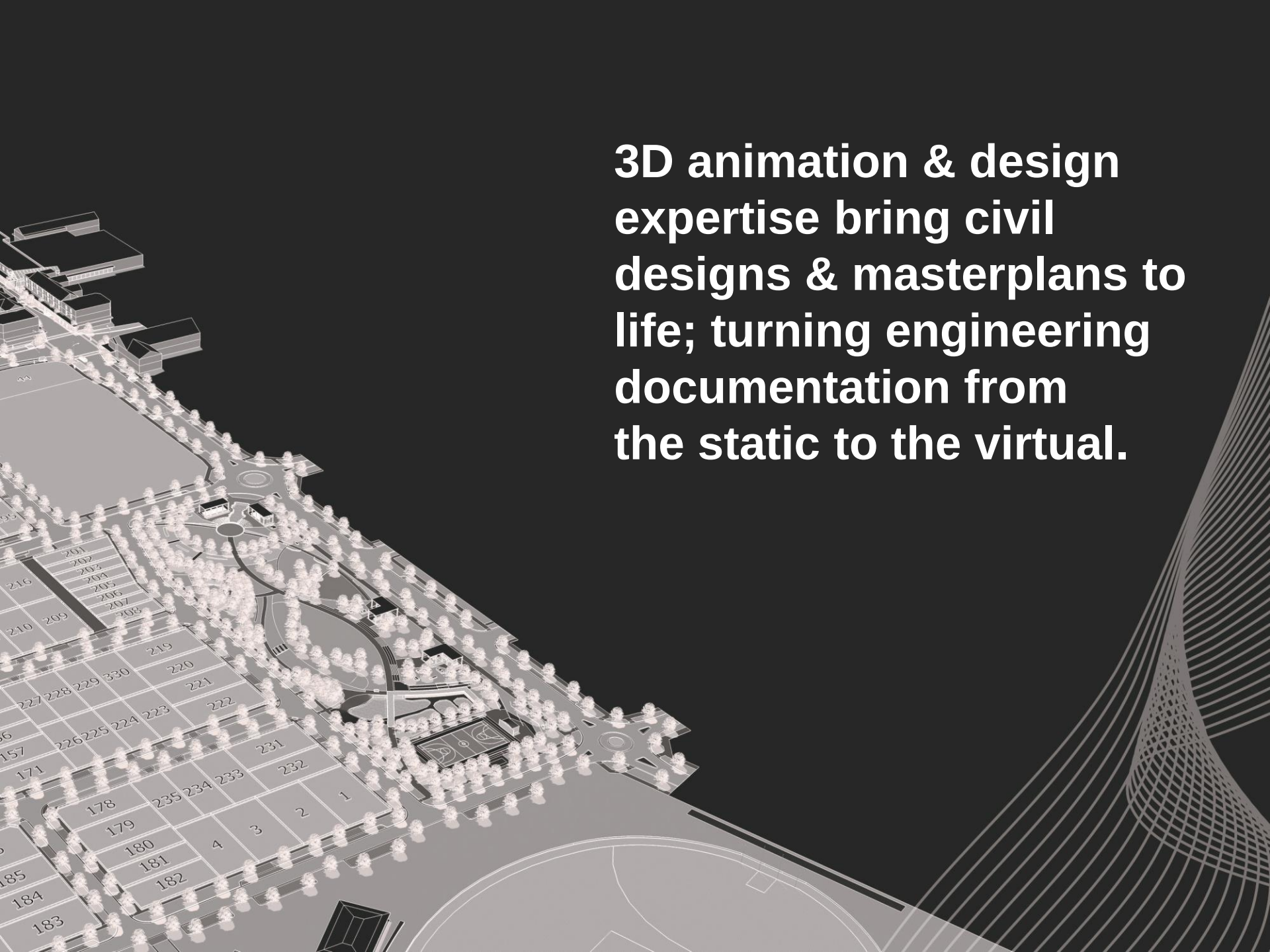

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DCE aims to be Australia’s most called on civil engineering consultancy because of its creative and sustainable solutions to 21st century challenges.

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subheading

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Map Page(Bold 26pt)

Subheading (regular 18pt)