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**TOOWOOMBA
REGIONAL COUNCIL**

**ENGINEERING SERVICES &
STORMWATER MANAGEMENT REPORT**

PROPOSED RESIDENTIAL SUBDIVISION

RIELLY STREET, TORRINGTON

For: TUNNEY INVESTMENTS

July 2026

Document Revision Status

Document Engineering Services & Stormwater Management Report – 470

Prepared By Andrew Mainwaring

Reviewed By Dan Cooper RPEQ: 9385 *Dan Cooper*

Revision	Revision Date	Details
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1. Introduction

AM Civil Consulting Engineers have been engaged by the developer, Tunney Investments, to provide an engineering services and stormwater management report in support of their application to Toowoomba Regional Council (TRC), for a proposed community title residential subdivision at Rielly Street, Torrington (refer to **Appendix A** for the lot layout plan). The following items will be addressed in this report.

- Bulk Earthworks
- Roadworks
- Stormwater Management
- Sewer
- Water

2. Site Location & Description

The site is located inside the Toowoomba Regional Council boundary at Lot 1 SP349893, Rielly Street, Torrington.

The subject site is currently vacant which is the balance land of a larger property (Lot 1 SP349893) which is currently being developed as an industrial subdivision.

The natural fall of the site is in a north to south direction, towards an existing gully located within private properties to the south. The overall slope of the site generally ranges in gradient from 5% to over 30%. Refer **Appendix B** for the stormwater catchment plans.

Figure 1 Site Location



3. Proposed Development

The proposal is to develop the site as a community title residential subdivision with associated bulk earthworks, sewer, water and service infrastructure.

At the time of writing this report there exists an operational works approval for an industrial subdivision within the northern portion of this property (OW/2025/3366). AM Civil Consulting Engineers have undertaken the detail design for this subdivision, which details new roadworks, stormwater, sewer and watermain infrastructure constructed adjacent to the subject site. At the time of writing, these works are well advanced and due for completion by September 2026.

It has therefore been assumed, whilst compiling this report, that these external infrastructure works will be constructed and in place, prior to the completion of the proposed construction to the subject site.

4. Data

In the preparation of this report, information about the site was gathered from the following sources:

- Detailed feature survey.
- TRC online mapping data
- AM Civil Consulting Engineers detail design drawings 357 (OW/2025/3366)
- AM Civil Consulting Engineers Stormwater Management report 357 revision E dated 30/04/2025.
- Core Consultants Slope Stability Assessment J003223-001-R-Rev 0 dated 16/06/26
- Rytenaskild Traffic Impact Assessment 26078 version 1 dated 01/06/26

5. Earthworks

Bulk earthworks will need to be undertaken on the subject site to ensure infrastructure can be installed to appropriately service the development whilst providing building platforms for the proposed allotments.

As the subject site is currently constrained by steep slopes, benched building pads (minimum 250m² areas) will be provided to all of the proposed allotments to accommodate future building construction.

The proposed access road will be a split carriageway configuration, separated by a landscaped batter to ensure appropriate access can be provided to all allotments, given the steep topography

The extent of the bulk earthworks proposed should not affect how any of the adjoining properties discharge stormwater, as they should remain relatively unchanged and as per the catchment design philosophy.

All bulk earthworks to be undertaken in accordance with AS3798 (Level 1 supervision)

Refer to **Appendix C** for our Bulk Earthwork Plan, showing the proposed extent of earthworks and Core Consultants Slope Stability Assessment J003223-001-R-Rev 0 dated 16/06/26.

6. Roadworks

Access to the subject site shall be via Rielly Street, which will require further extension works to accommodate the new intersection.

The proposed access road will be a split carriageway configuration, separated by a landscaped batter to ensure appropriate access can be provide to all allotments, given the steep topography.

Secondary access to the south is also provided via a 10m wide laneway for future connectivity.

The internal access roads will be sealed pavements (concrete or asphalt surfaced) and terminate at a cul-de-sac turning area suitable for TRC's standard garbage truck template.

Refer to **Appendix D** for the preliminary civil design drawings, showing extent of existing roadworks and Rytenkild Traffic Impact Assessment 26078 version 1 dated 01/06/26

7. Stormwater Management

As noted previously operational works are currently being undertaken for an industrial subdivision within the northern portion of this property, which will provide a drainage reserve directly to the west of the subject site, containing detention and bio retention basins. The design of these basins are detailed in AM Civil Consulting Engineers Stormwater Management report 357 revision E dated 30/04/2025.

Further analysis of this stormwater management report and modelling has been undertaken to ascertain the impact of discharging the subject site's stormwater to these basins and if any upgrade or augmentation may be required.

7.1 Quantity

The point of discharge for the site has been identified as the drainage reserve located directly to the west. Stormwater runoff from the developed subject site is split into 3 catchments as follows:

- **Catchment 1** – The northern portion of the development site with all stormwater flows up to & including the 1% AEP event to be routed towards the drainage reserve to the west via the internal road carriageway for quantity and quality treatment.
- **Catchment 2** – The majority of the southern portion of the site with all stormwater flows up to & including the 5% AEP event to be routed towards the drainage reserve to the west via level 3 interallotment drainage for quantity and quality treatment. Stormwater flows from catchment 2 in excess of the 5% AEP event to discharge to the south via sheet flow similar to pre-developed conditions.

- Catchment 3 - Stormwater runoff to discharge to the south via sheet flow similar to pre-developed conditions.

Refer to **Appendix B** for the stormwater catchment plans.

7.2 Hydrology

We have determined a post developed fraction impervious of 0.6.

The following tables highlight the parameters used in the hydraulic model.

Table 1 – Pre-developed conditions - Calculated Parameters and Results

Catchment Name	1
Catchment Area (ha)	3.27
Time of concentration (minutes) Impervious	- (0%)
Time of concentration (minutes) Pervious	10 (100%)
Total 0.5EY Flows (m ³ /s)	0.287
Total 1% AEP Flows (m ³ /s)	1.22

Table 2 – Post-developed conditions - Calculated Parameters and Results

Catchment Name	1	2	3	4
Catchment Area (ha)	1.868	3.992	2.800	11.813
Time of concentration (minutes) Impervious	7.5 (60%)	7.5 (60%)	7.5 (10%)	-
Time of concentration (minutes) Pervious	10 (40%)	10 (40%)	10 (90%)	-
Total 1EY Flows (m ³ /s)	0.304	0.151	0.043	2.251
Total 1% AEP Flows (m ³ /s)	0.756	0.376	0.179	6.346

Post developed catchment 4 shown above is for the entire industrial development to the north which is detailed in AM Civil Stormwater Management Report 357 revision E dated 30/04/2025 (shown as catchments A to D). Refer to this report for parameters such as time of concentration, etc.

7.3 Hydraulic Modelling

Storm water analysis for this report has been undertaken using DRAINS. DRAINS is a modelling software package developed for the design and analysis of urban storm water drainage systems. We have adopted the initial and continuing loss hydrology model to convert Australian Rainfall and Runoff (2019) Temporal Patterns and rainfall data into runoff Hydrographs.

Table 3 – Initial Loss & Continuing Loss Parameters

	Impervious (mm)	Pervious (mm)
Initial Loss	0	30
Continuing Loss	0	3

The adopted method to determine the sites hydrology is in accordance with the procedures and methods stated in Australian Rainfall and Runoff: A Guide to Flood Estimation, 2019, Commonwealth of Australia (ARR19). As per ARR19, an ensemble of rainfall events from the 1EY to the 1% AEP design event, with a duration of 10 minutes to 3 hours have been undertaken, and the mean storm event for each ensemble of 10 rainfall patterns was adopted for the hydraulic model.

Intensity-Frequency-Duration (IFD) data for the site has been derived in accordance with ARR19 and via Bureau of Meteorology's (BOM) Rainfall IFD Data System. The rainfall intensities generated for the site have been derived from the co-ordinates: -27.564 and 151.936 (Toowoomba)

The detention system has been modelled for each storm event scenario to assist in establishing peak discharge and required storage capacity to maintain pre-development flows.

The following tables highlight worse case inflow/outflow for the mean storm events.

Table 4 – Stormwater Modelling Results – Catchments 1 - 4.

Peak Storm Events (AEP/EY)	1 Pre-Development Peak Discharge (m ³ /s)	Peak Storm Events (AEP/EY)	2 Post-Development Peak Discharge (m ³ /s)	Storage Capacity (m ³)	3 Post Development With Detention(m ³)	% Variation to Pre Developed (Col 1 vs Col 3)
2EY	0.309	2EY	1.642	4500	0.236	-23.6
1EY	0.492	1EY	2.024	4500	0.411	-16.5
0.5EY	0.952	0.5EY	2.698	4500	0.630	-33.8
20%	1.462	20%	3.350	4500	0.790	-54.0
10%	2.148	10%	3.996	4500	0.967	-55.0
5%	2.707	5%	4.622	4500	1.100	-59.3
2%	3.580	2%	5.494	4500	2.123	-40.7
1%	4.270	1%	6.221	4500	2.861	-33.0

Based on the DRAINS modelling results, discharging the development stormwater runoff towards the existing **4,500m³** detention basin, attenuates the nominated catchment flows to pre-development conditions for the 2EY to 1% AEP rainfall events.

It is noted that the post development flows in excess of the 5% AEP event from catchment 2 and all of post development flows from catchment 3 will bypass the detention basin and discharge via sheet

flow towards the southern boundary, similar to pre-developed conditions. As these post developed peak flows will be substantially less than the pre-developed condition no further management should be required. The following table shows the pre and post development peak discharge rates:

Table 5 – Post-developed conditions - Calculated Parameters and Results

	Total 1EY Flows (m ³ /s)	Total 1% AEP Flows (m ³ /s)
Pre-developed site discharge to the south	0.287	1.22
Post-developed site discharge to the south	0.043	0.293

Refer to **Appendix D** for our preliminary site plan showing the proposed stormwater management solution and **Appendix E** for hydraulic modelling data.

7.4 Pollutant Modelling

The development of the proposed subdivision will lead to an increase in total suspended solids, total phosphorus, total nitrogen and gross pollutants conveyed by stormwater runoff from the site. In order to achieve the reduction targets identified in TRC's Stormwater Quality policy of 85% of the total suspended solid load, 60% of the total phosphorus load, and 45% of the total nitrogen load, suitable treatments methods will need to be incorporated into the development.

To assess the discharge concentrations of the above key pollutants from the development, the site was modelled (using *MUSIC* software) for the following scenarios:

- Post-developed, pre-treatment.
- Post-developed, post treatment.

The developed site was modelled as residential to reflect the development catchment areas and treatment routing as follows:

- Development Site – 60 % imp

Meteorological data for Toowoomba was used with 10 years of rainfall data analysed between 1/1/1961 – 31/12/1970 at 6-minute time intervals.

The parameters used within this report for run off generation and flow pollutant concentrations are in accordance with *Water By Design MUSIC Modelling Guidelines, Version 1.0-2010*.

7.5 Treatment Option

The treatment train option adopted is to route the 4EY (Q_3 month) flows into the existing bio-retention basin contained within the drainage reserve directly to the west.

The design of this basin has been detailed within AM Civil Stormwater Management Report 357 revision E dated 30/04/2025, which shows a filter treatment area of 800m² (0.5m deep) and assumed that 50% of all roof water (assuming roof area will be 30% of the total lot area) will discharge to rainwater tanks and be re-used internally as well as external irrigation (for the industrial subdivision).

For the proposed subject site we have also assumed that 50% of all roof water (assuming 250m² roof areas/lot) will discharge to rainwater tanks and be re-used internally as well as external irrigation.

The extended modelling has shown that the filter treatment of the existing basin will need to be increased to 950m² (0.5m deep) to ensure pollutant reduction targets are maintained for the industrial subdivision and the new residential development.

Figure 2 – MUSIC Model Layout

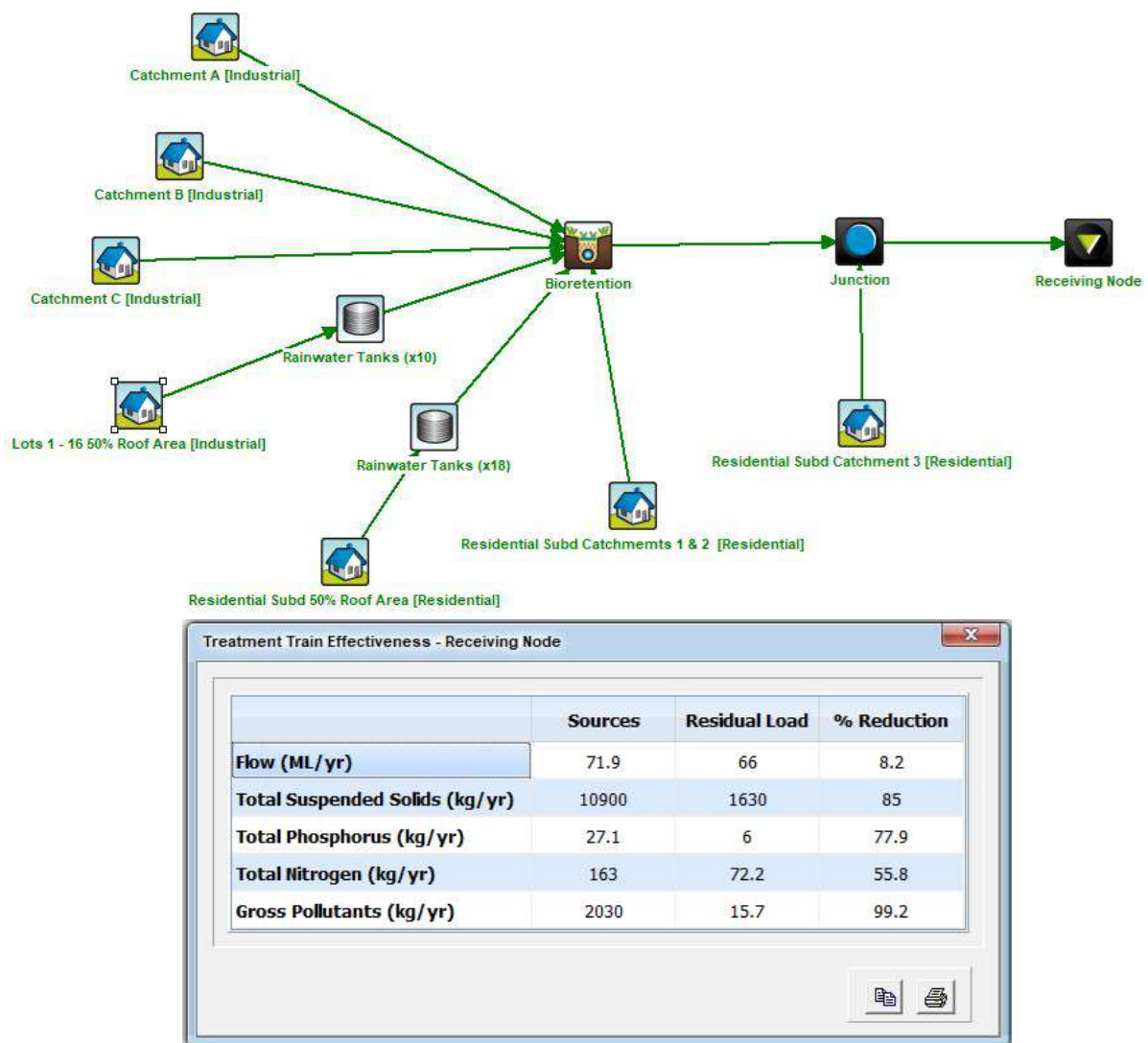


Figure 3 – Summary of Rainwater Tank Node (Residential Only)

The image shows two overlapping software dialog boxes for configuring rainwater tanks.

Properties of Rainwater Tanks (x18)

- Location:** Rainwater Tanks (x18)
- Inlet Properties:**
 - Low Flow By-pass (cubic metres per sec): 0.000000
 - High Flow By-pass (cubic metres per sec): 100.000000
- Individual Tank Properties:**
 - Number of Tanks: 18
- Total Tank Properties:**
 - Storage Properties:**
 - Volume below overflow pipe (kL): 180.00
 - Depth above overflow (metres): 0.20
 - Surface Area (square metres): 90.0
 - Initial Volume (kL): 90.00
 - Outlet Properties:**
 - Overflow Pipe Diameter (mm): 212
 - ☐ Use Custom Outflow and Storage Relationship
 - Define Custom Outflow and Storage: Not Defined
- Buttons:** Re-use, Fluxes..., Notes..., More, Cancel, Back, Finish

Re-use for Rainwater Tanks (x18)

- ☒ Use stored water for irrigation or other purpose
- Max Drawdown height (m):** 2 (Range: (0 - 2.00))
- Annual Demand:** ☐ Enabled
- Daily Demand:** ☒ Enabled
 - Daily Demand Properties:**
 - Demand (kL/day): 8.9
 - Distribution: Uniform
- Custom Demand:** ☐ Enabled
- Buttons:** Ok, Cancel

Figure 4 – Summary of Bio Basin Node

The image shows the 'Properties of Bioretention' dialog box with various configuration options.

Properties of Bioretention

- Location:** Bioretention
- Inlet Properties:**
 - Low Flow By-pass (cubic metres per sec): 0.000
 - High Flow By-pass (cubic metres per sec): 100.000
- Storage Properties:**
 - Extended Detention Depth (metres): 0.30
 - Surface Area (square metres): 1100.00
- Filter and Media Properties:**
 - Filter Area (square metres): 950.00
 - Unlined Filter Media Perimeter (metres): 150.00
 - Saturated Hydraulic Conductivity (mm/hour): 180.00
 - Filter Depth (metres): 0.50
 - TN Content of Filter Media (mg/kg): 400
 - Orthophosphate Content of Filter Media (mg/kg): 30.0
- Infiltration Properties:**
 - Exfiltration Rate (mm/hr): 0.00
- Lining Properties:**
 - Is Base Lined? ☐ Yes ☒ No
- Vegetation Properties:**
 - ☒ Vegetated with Effective Nutrient Removal Plants
 - ☐ Vegetated with Ineffective Nutrient Removal Plants
 - ☐ Unvegetated
- Outlet Properties:**
 - Overflow Weir Width (metres): 2.00
 - Underdrain Present? ☒ Yes ☐ No
 - Submerged Zone With Carbon Present? ☐ Yes ☒ No
 - Depth (metres): 0.45
- Buttons:** Fluxes..., Notes..., More, Cancel, Back, Finish

The results of the treatment modelling undertaken in *MUSIC* are summarised below:

Table 6 – Post Development Modelling Results (Industrial & Residential Developments Combined)

	Flow (ML/yr)	Suspended Solids (kg/yr)	Total Phosphorous (kg/yr)	Total Nitrogen (kg/yr)	Gross Pollutants (kg/yr)
Pre treatment	71.9	10900	27.1	163	2030
Post treatment	66	1630	6	72.2	15.7
Reduction (%)	8.2	85	77.9	55.8	99.2
Target Reduction (%)	0	85	60	45	90

As demonstrated by the pollutant modelling above, the bioretention basin located within the drainage reserve immediately west of the development will need to be increased in area from 800 m² to 950 m². The proposed augmentation works should be capable of being accommodated within the existing basin footprint without compromising its current stormwater management function.

The results highlight that the treatment option detailed above will achieve the storm water quality objectives identified in TRC's stormwater quality policy.

8. Sewer

A DN225 gravity sewer is currently being installed within the industrial subdivision to the north of the development site (OW/2025/3366). This sewer system will be significantly higher in elevation than the development and thus no gravity connection will be possible.

Therefore, it is proposed to provide an internal DN150 sewer reticulation system to service all allotments, which will gravity feed towards an on-site packaged sewer pump station located within the culdesac head, adjacent to lot 11 (near the low point of the site). A sewer pressure main will then be connected to the nearest point of the new upstream sewer system, located within the adjacent industrial subdivision.

All new sewer infrastructure will be in accordance with current and applicable TRC Plumbing & Drainage policies, WSAA standards & Australian Standard AS3500.

Refer to **Appendix D** to for the preliminary site layout plan which shows the preliminary sewer reticulation layout and connection.

9. Water

A DN150mm PVC water main (and fire hydrants) is currently being installed within the industrial subdivision to the north of the development site (OW/2025/3366), which should provide adequate connection for the proposed development.

A new DN100mm PVC water main will be extended through the new common road corridor with associated fire hydrants and sluice valves located in accordance with current Plumbing & Drainage policies and Australian Standard AS3500.

Refer to **Appendix D** to for the preliminary site layout plan which shows the preliminary water reticulation layout.

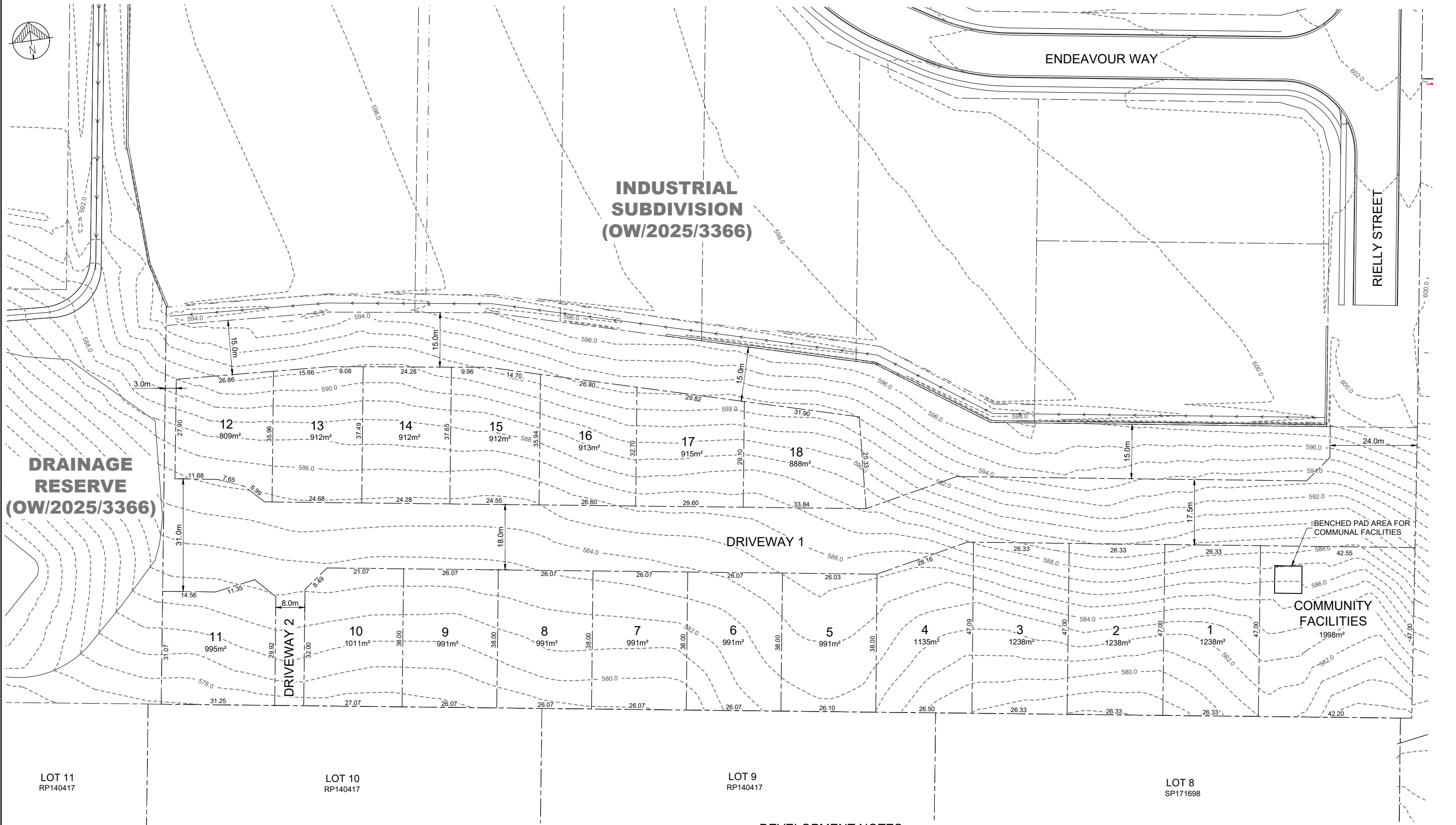
10. Conclusions & Recommendations

In support of a DA application for a community title residential subdivision, we have analysed the engineering service constraints for the site, which include:

- **Earthworks** – Bulk earthworks will need to be undertaken on the subject site to ensure infrastructure can be installed to appropriately service the development whilst providing building platforms for the proposed allotments. The extent of the bulk earthworks proposed should not affect how any of the adjoining properties discharge stormwater, as they should remain relatively unchanged.
- **Roadworks** – Access to the subject site shall be via Rielly Street, which will require further extension works to accommodate the new intersection. The proposed access road will be a split carriageway configuration, separated by landscaped batter to ensure appropriate access can be provided to all allotments.
- **Stormwater (Quantity)** – The point of discharge for the site has been identified as the drainage reserve located directly to the west which is currently be constructed as part of operational works OW/2025/3366. The detention basin contained within this drainage reserve has capacity to cater for the proposed residential development and provide non-worsening of peak stormwater flows, without the need for any augmentation or upgrade works.
- **Stormwater (Quality)** – The development will result in an increase in the export of total suspended solids, total nitrogen and total phosphorus from the site. In order to achieve the reduction targets identified in Toowoomba Regional Council's Stormwater Quality requirements, the treatment train option adopted is to route the 4EY (Q₃ month) flows into the bio-retention basin contained within the adjacent drainage reserve (as noted above). The filter treatment of the existing basin will need to be increased from 800m² to 950m² (0.5m deep) to ensure pollutant reduction targets are maintained for the industrial subdivision and the new residential development.
- **Sewer** – An internal DN150 sewer reticulation system to service all allotments will be provided, which will gravity feed towards an on-site packaged sewer pump station located near the low point of the site. A sewer pressure main will then be connected to the nearest point of the new upstream sewer system, located within the adjacent industrial subdivision.
- **Water** – A DN150mm PVC water main (and fire hydrants) is currently being installed within the industrial subdivision to the north of the development site (OW/2025/3366), which should provide adequate connection for the proposed development.

Based on the information collated and preliminary investigations, it seems that the proposed development can be adequately serviced in accordance with Toowoomba Regional Council's Development Guidelines and Planning Scheme.

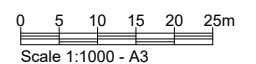
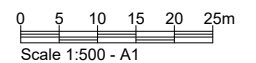
Appendix A



INTERVALS BETWEEN CONTOURS - 1.0m
CONTOURS ARE NATURAL SURFACE LEVELS

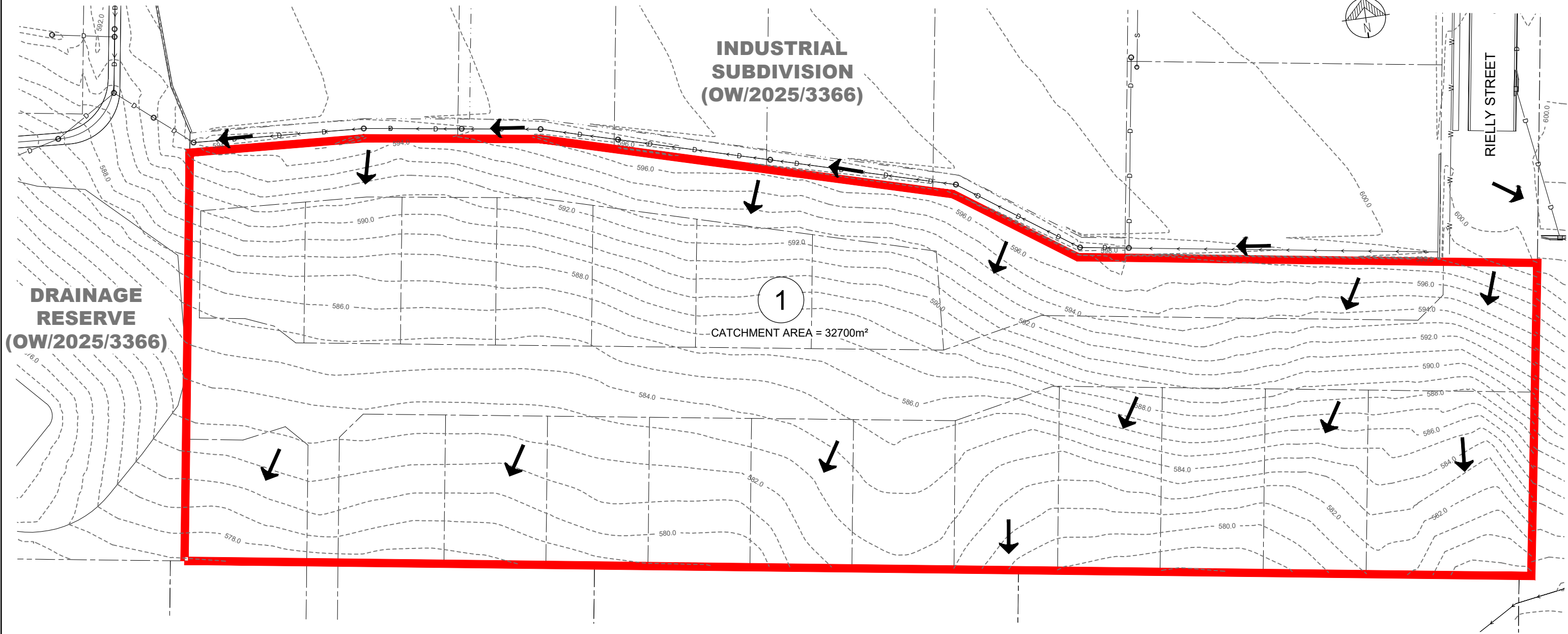
ROAD WORKS SHOWN TO REILLY STREET & ENDEAVOUR WAY INCLUDING ALL SERVICE INFRASTRUCTURE IS CURRENTLY BEING COMPLETED AS PART OF OPERATIONAL WORKS APPROVAL PERMIT OW/2025/3366. IT HAS BEEN ASSUMED THAT THESE WORKS WILL BE COMPLETE AND ON MAINTENANCE PRIOR TO ANY CIVIL CONSTRUCTION WORKS COMMENCING ON THE SUBJECT SITE. COUNCIL TO PROVIDE APPROPRIATE CONDITIONING AS PART OF ANY NEW DA APPROVAL TO THIS EFFECT.

1. PROPOSED RESIDENTIAL DEVELOPMENT TO BE STRATA GROUP TITLE
2. ROAD ACCESS OF REILLY STREET MAY BE SPLIT LEVEL TO PROVIDE BETTER DRIVEWAY ACCESS TO ALLOTMENTS
3. THE MAJORITY OF THE STORMWATER RUNOFF FROM THE DEVELOPMENT TO DISCHARGE TO THE DRAINAGE RESERVE (DETENTION BASIN) TO THE WEST.
4. MINOR STORMWATER CATCHMENT AREA (LOTS 1 - 4) MAY DISCHARGE TO THE SOUTHEAST VIA EXIST GULLY AT PRE-DEVELOPMENT PEAK FLOWS (NON WORSENING)
5. INTERNAL SEWER RETICULATION TO GRAVITATE TO A PRIVATE SEWER PUMP STATION LOCATED NEAR THE CULDESAC HEAD, WHICH WILL THEN BE PUMPED UP TO THE REILLY STREET GRAVITY SEWER SYSTEM, VIA A PRIVATE RISING MAIN.
6. INTERNAL WATER RETICULATION TO BE SERVICED VIA REILLY STREET INFRASTRUCTURE



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						TUNNEY INVESTMENTS		PROPOSED RESIDENTIAL SUBDIVISION 229 ROBSON HURSLEY ROAD TORRINGTON		PRELIMINARY LOT LAYOUT PLAN		Designed: APM		Date 15/07/26	
A FOR APPROVAL 15/07/26 APM												Drawing No. MP-01		Revision A	
REVISIONS DATE DWN CHK APP															

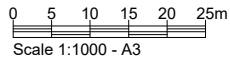
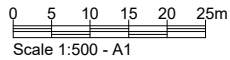
Appendix B



CONTOUR NOTE:
INTERVALS BETWEEN CONTOURS - 1.0m
CONTOURS ARE NATURAL SURFACE LEVELS

LEGEND:

- PROPERTY BOUNDARY
- █ EXTENT OF STORMWATER CATCHMENT AREA
- ① CATCHMENT NAME
- ➔ PRE DEVELOPMENT OVERLAND FLOW DIRECTION



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Client
TUNNEY INVESTMENTS

Project
PROPOSED RESIDENTIAL SUBDIVISION
229 ROBSON HURSLEY ROAD
TORRINGTON

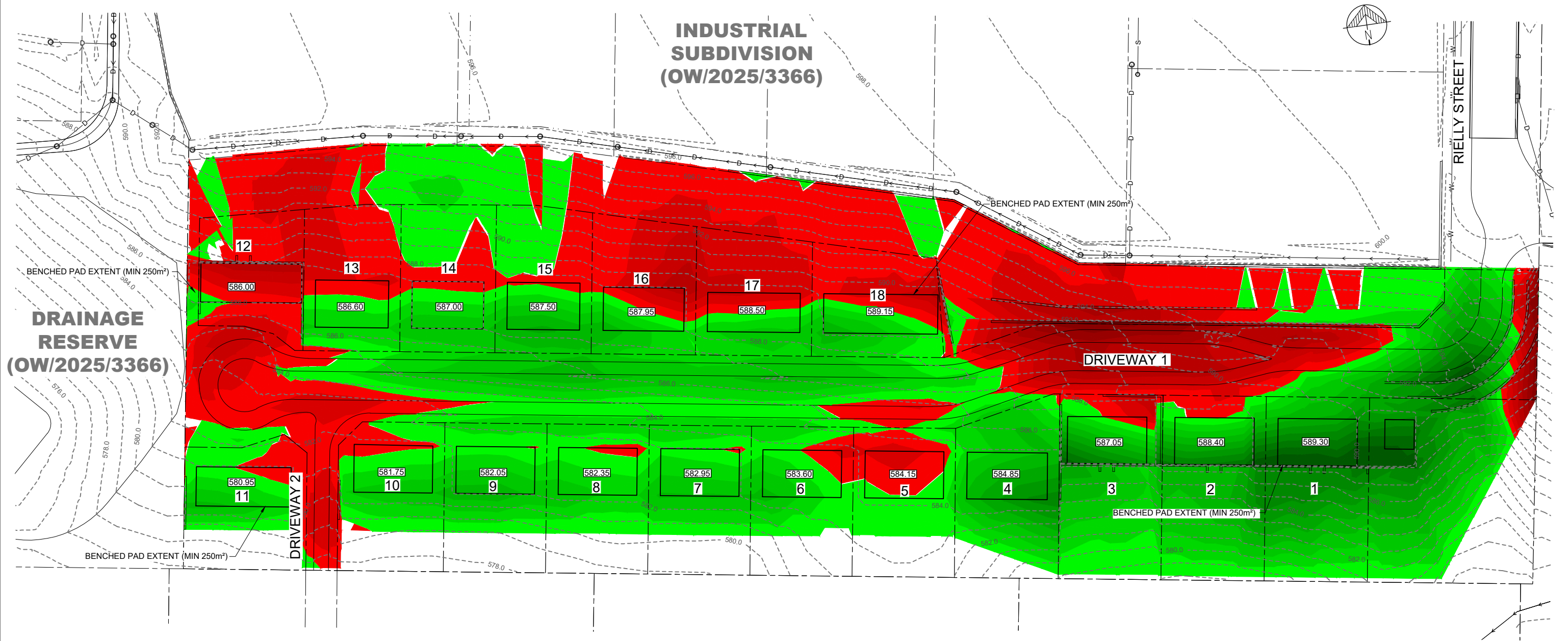
Title
STORMWATER CATCHMENT PLAN
PRE DEVELOPMENT

Drawn: **APM**
Designed: **APM**

Approved (R.P.E.Q.) **9385**
Dan Cooper
DANIEL J. COOPER

Job No. **470**
Date **15/07/26**
Drawing No. **DMP-01** Revision **A**

Appendix C



CUT/FILL LEGEND:

FILL 0.1m - 0.5m	CUT 0.1m - 0.5m
FILL 0.5m - 1.0m	CUT 0.5m - 1.0m
FILL 1.0m - 1.5m	CUT 1.0m - 1.5m
FILL 1.5m - 2.0m	CUT 1.5m - 2.0m
FILL 2.0m - 2.5m	CUT 2.0m - 2.5m
FILL 2.5m - 3.0m	CUT 2.0m - 2.5m
FILL 3.0m - 3.5m	CUT 2.5m - 3.0m
FILL 3.5m - 4.0m	CUT 3.0m - 3.5m
FILL 4.0m - 4.5m	
FILL 4.5m - 5.0m	
FILL 5.0m - 5.5m	

EARTHWORKS VOLUMES

CUT = -8,018m
FILL = 18,783m³
BALANCE = -10,765m³
("-" EXPORT, "+" IMPORT)

NOTES

- EXCLUDES BULKING, COMPACTION FACTORS & SERVICE TRENCHES
- ALLOWANCE FOR MINIMUM ROAD BOX INCLUDED IN VOLUMES (300mm).

CONTOUR NOTE:

INTERVALS BETWEEN CONTOURS - 1.0m
CONTOURS ARE DESIGN SURFACE LEVELS

0 5 10 15 20 25m
Scale 1:500 - A1

0 5 10 15 20 25m
Scale 1:1000 - A3

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Client

TUNNEY INVESTMENTS

Project

PROPOSED RESIDENTIAL SUBDIVISION
229 ROBSON HURSLEY ROAD
TORRINGTON

Title

PRELIMINARY BULK EARTHWORKS PLAN

Drawn: **APM**

Designed: **APM**

Approved (R.P.E.Q.) **9385**

Dan Cooper

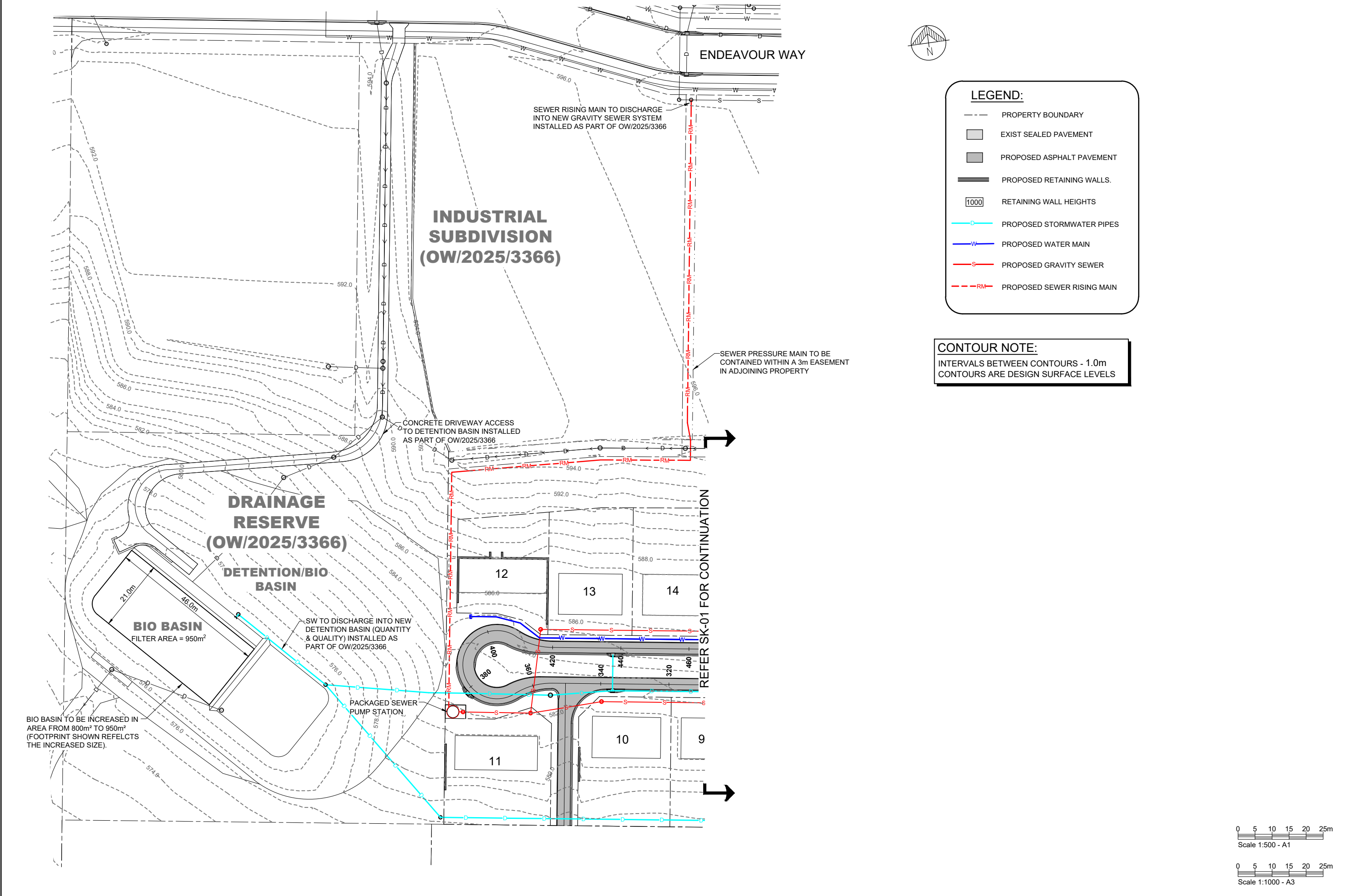
DANIEL J. COOPER

Job No. **470**

Date **15/07/26**

Drawing No. **SK-03** Revision **A**

Appendix D



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Client
TUNNEY INVESTMENTS

Project
PROPOSED RESIDENTIAL SUBDIVISION
229 ROBSON HURSLEY ROAD
TORRINGTON

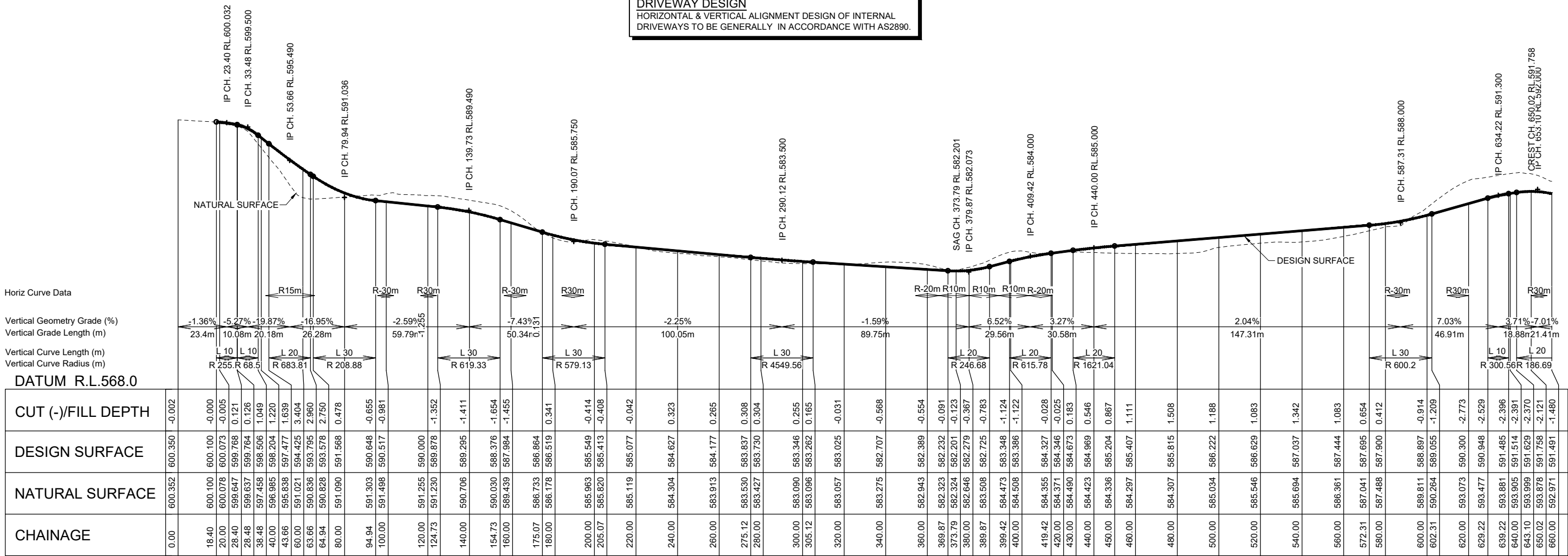
Title
PRELIMINARY SITE PLAN
SHEET 2

Drawn: **APM**
Designed: **APM**

Approved (R.P.E.Q.) **9385**
Dan Cooper
DANIEL J. COOPER

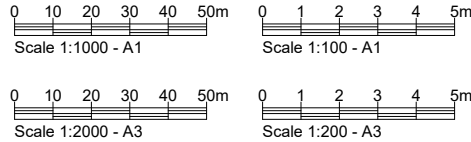
Job No. **470**
Date **15/07/26**
Drawing No. **SK-02**
Revision **A**

DRIVEWAY DESIGN
HORIZONTAL & VERTICAL ALIGNMENT DESIGN OF INTERNAL
DRIVEWAYS TO BE GENERALLY IN ACCORDANCE WITH AS2890.



DRIVEWAY 1 LONGITUDINAL SECTION

SCALE 1:1000 (H); 1:100 (V)



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Client
TUNNEY INVESTMENTS

Project
PROPOSED RESIDENTIAL SUBDIVISION
229 ROBSON HURSLEY ROAD
TORRINGTON

Title
PRELIMINARY DRIVEWAY 1
LONG SECTION

Drawn: **APM**

Designed: **APM**

Approved (R.P.E.Q.) **9385**

Dan Cooper

DANIEL J. COOPER

Job No. **470**

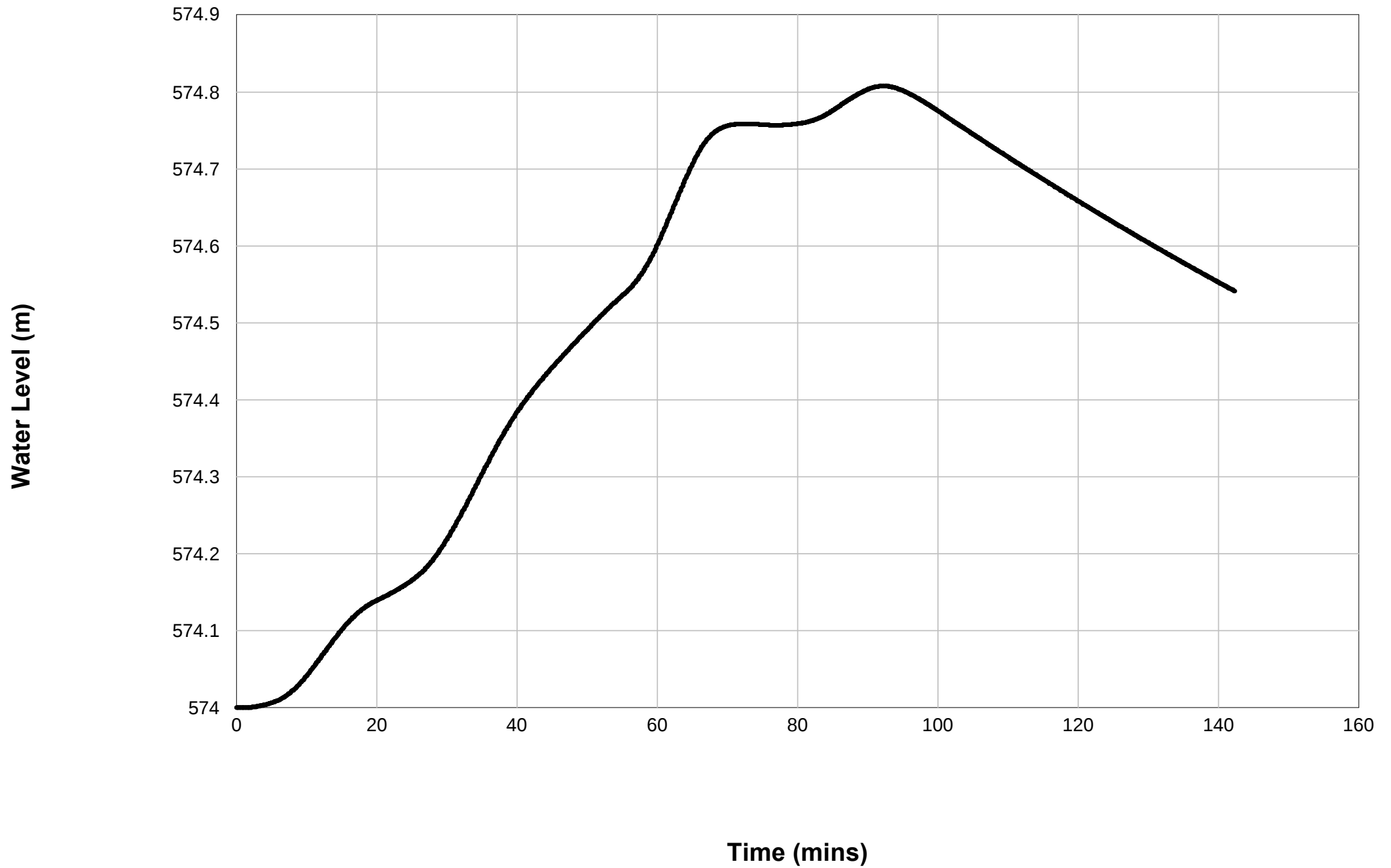
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Drawing No. **SK-04**

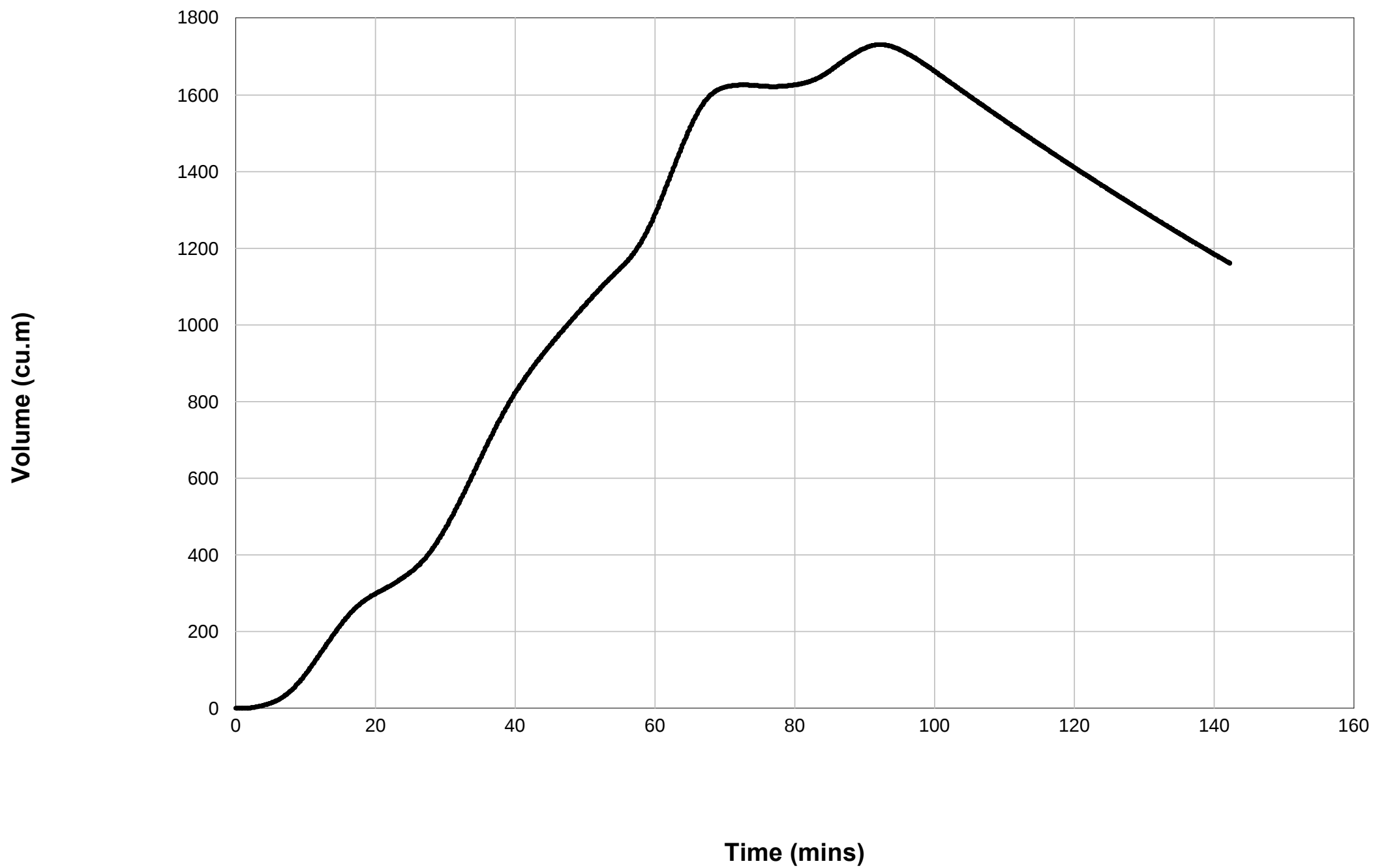
Revision **A**

Appendix E

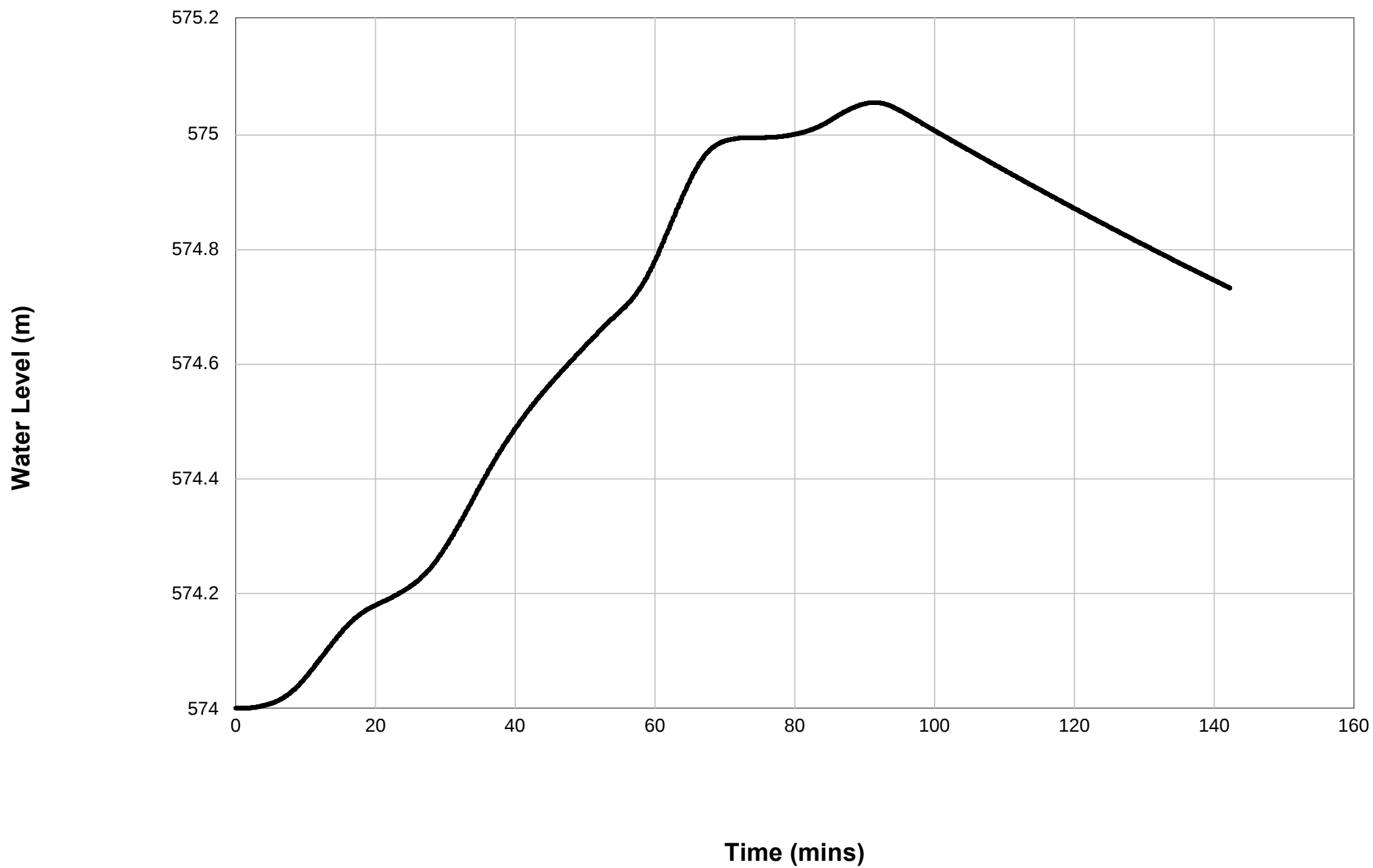
Basin Water Level - 2EY AEP, 1.5 hour burst, Storm 6



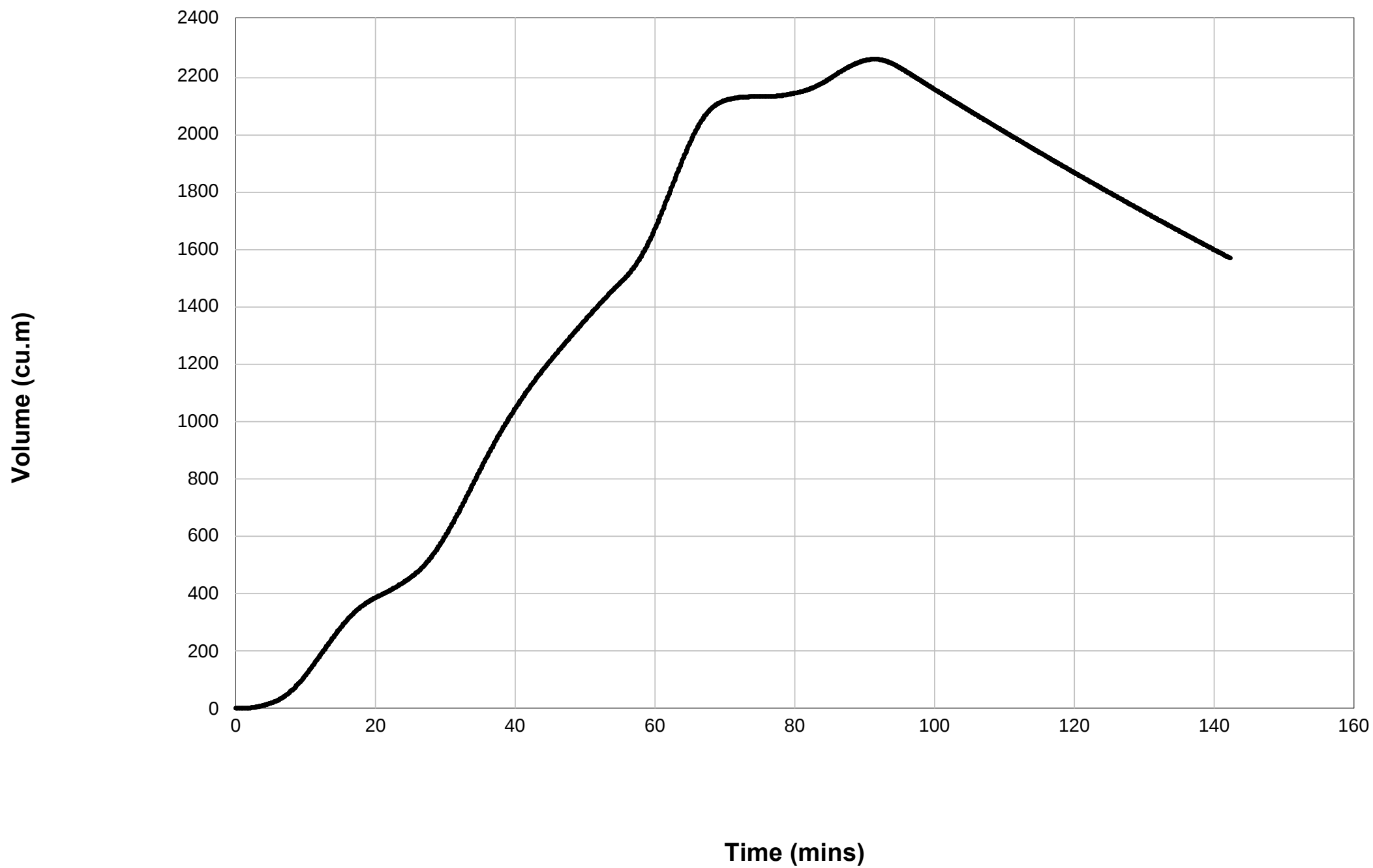
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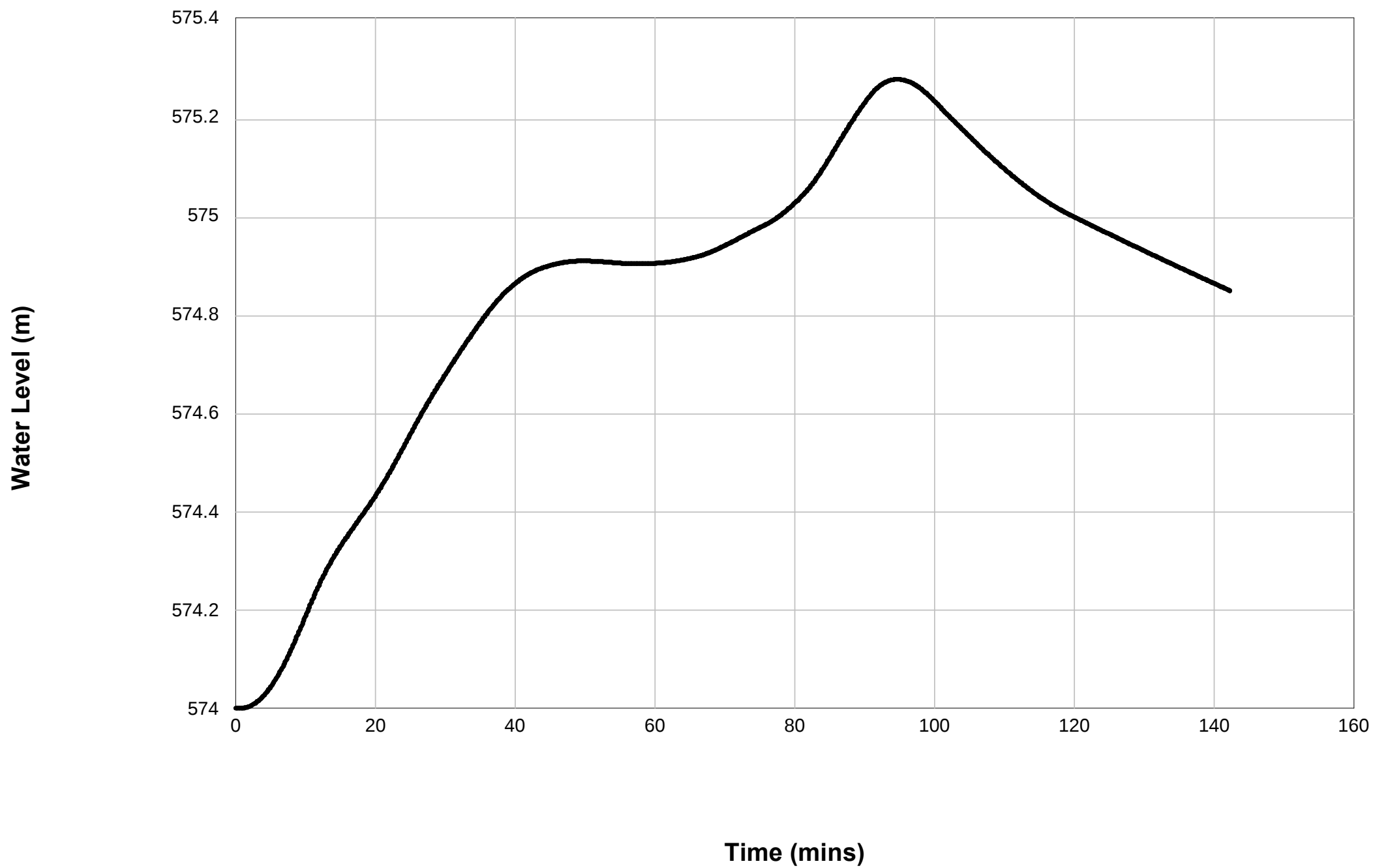
Basin Water Level - 1EY AEP, 1.5 hour burst, Storm 6



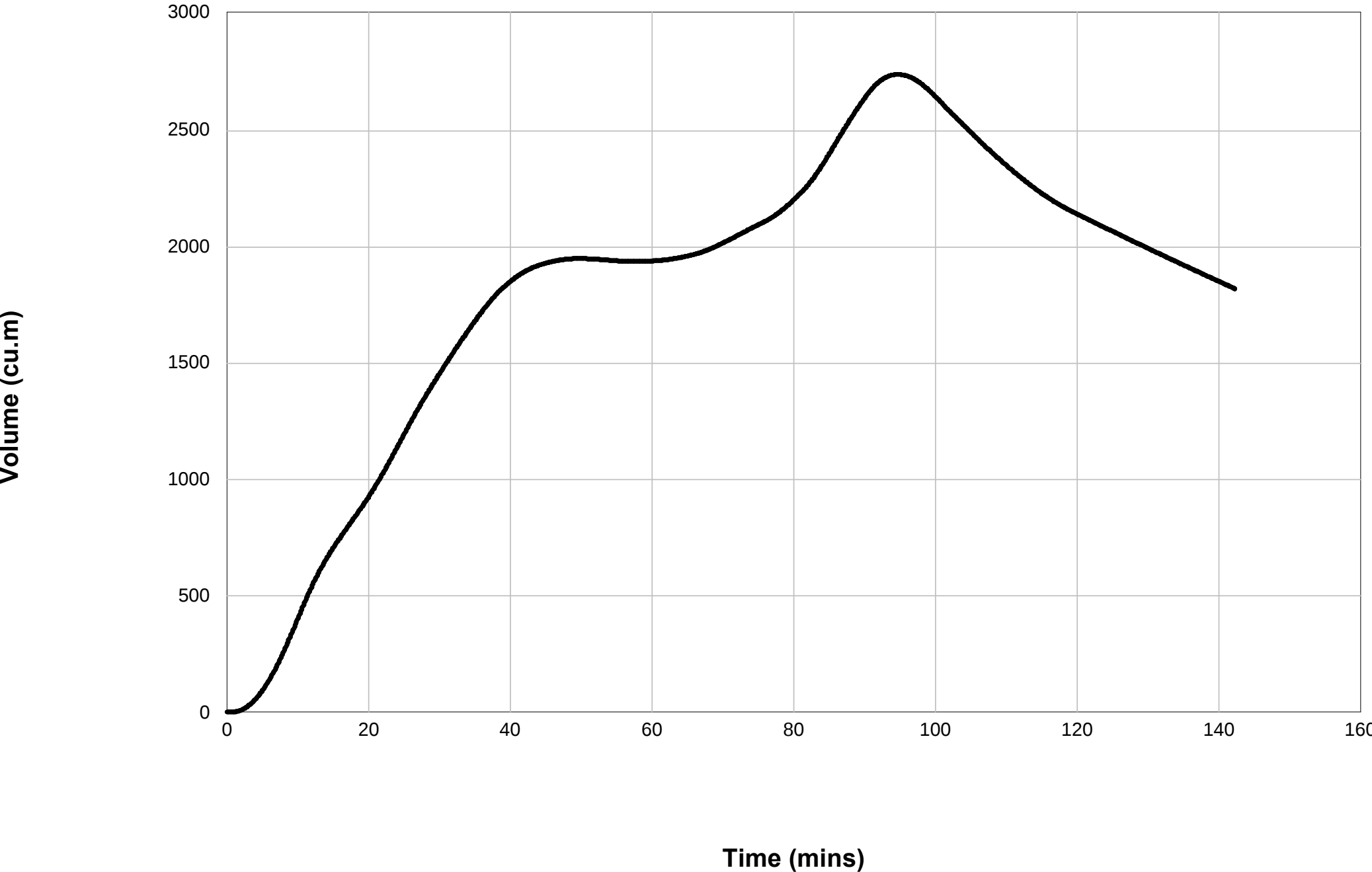
Basin Storage Volume - 1EY AEP, 1.5 hour burst, Storm 6



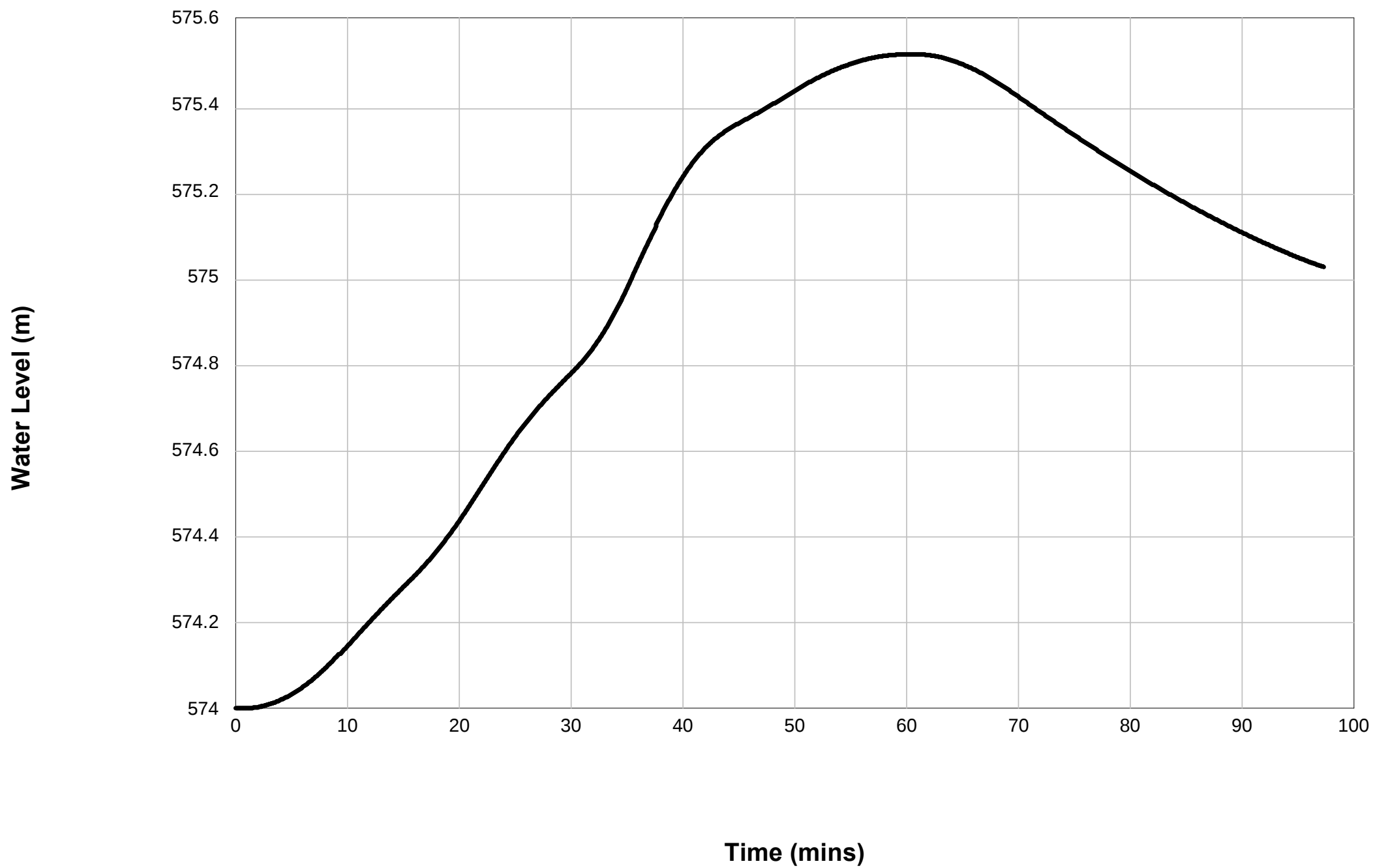
Basin Water Level - 0.5EY AEP, 1.5 hour burst, Storm 2



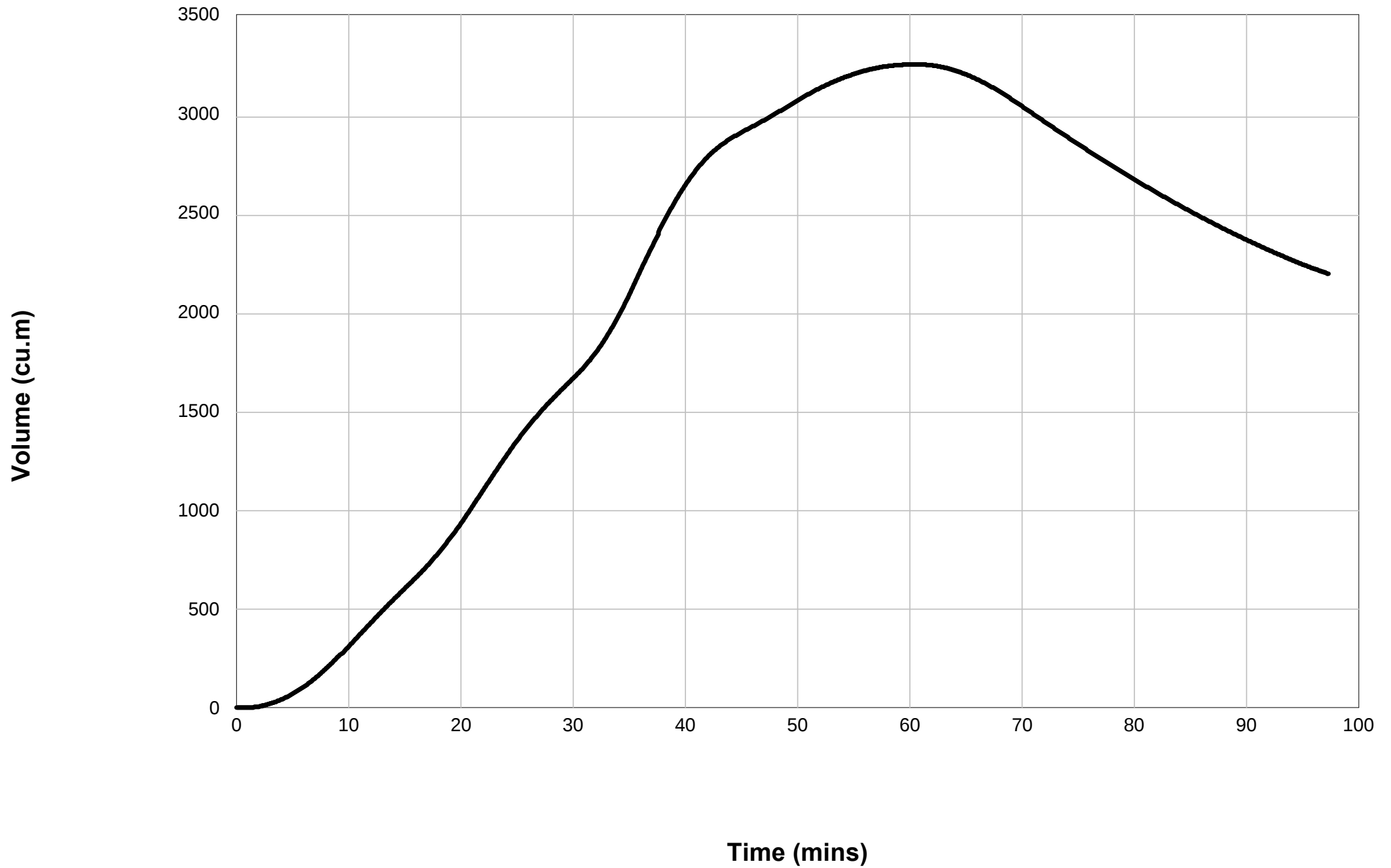
Basin Storage Volume - 0.5EY AEP, 1.5 hour burst, Storm 2



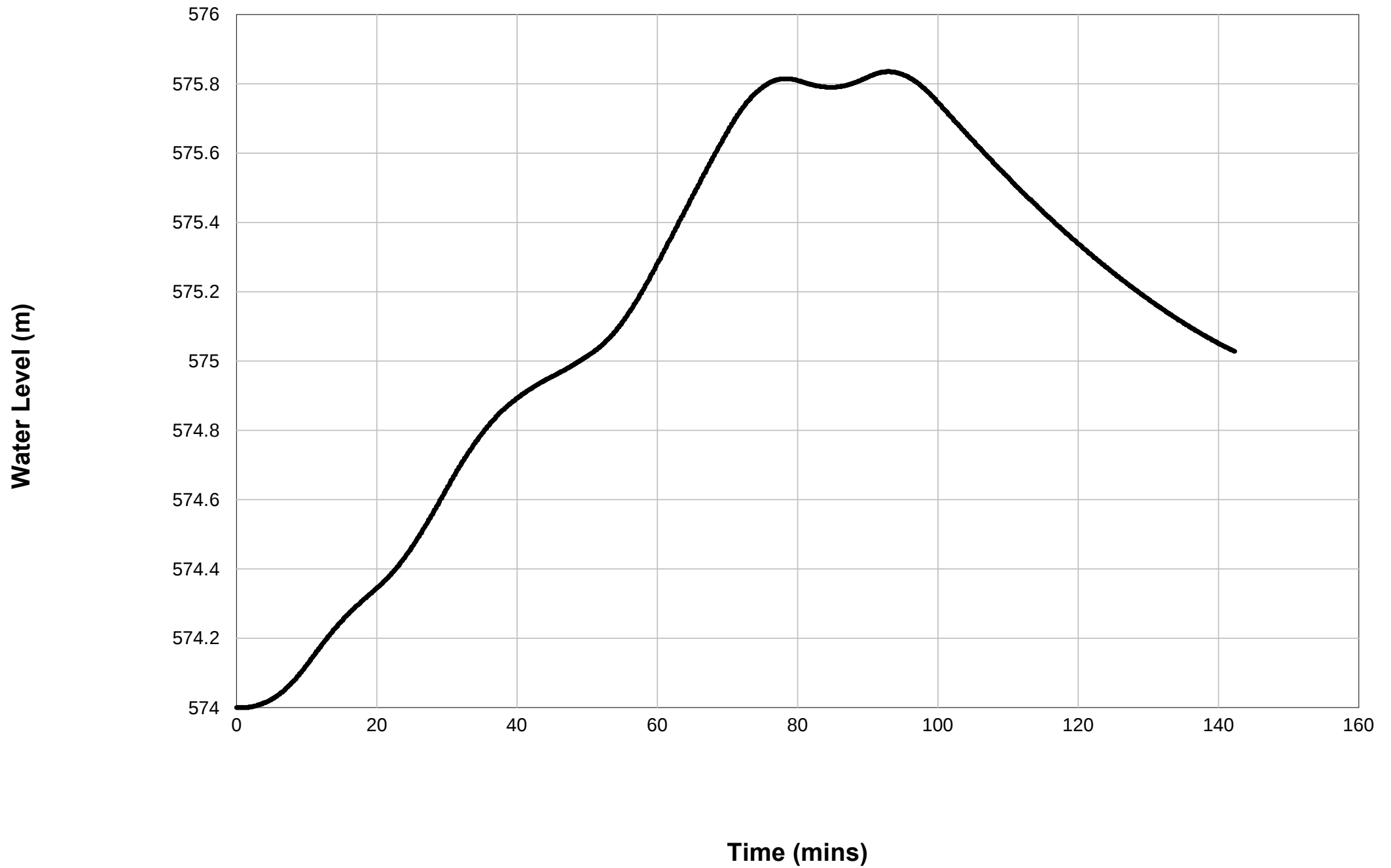
Basin Water Level - 20% AEP, 1 hour burst, Storm 5



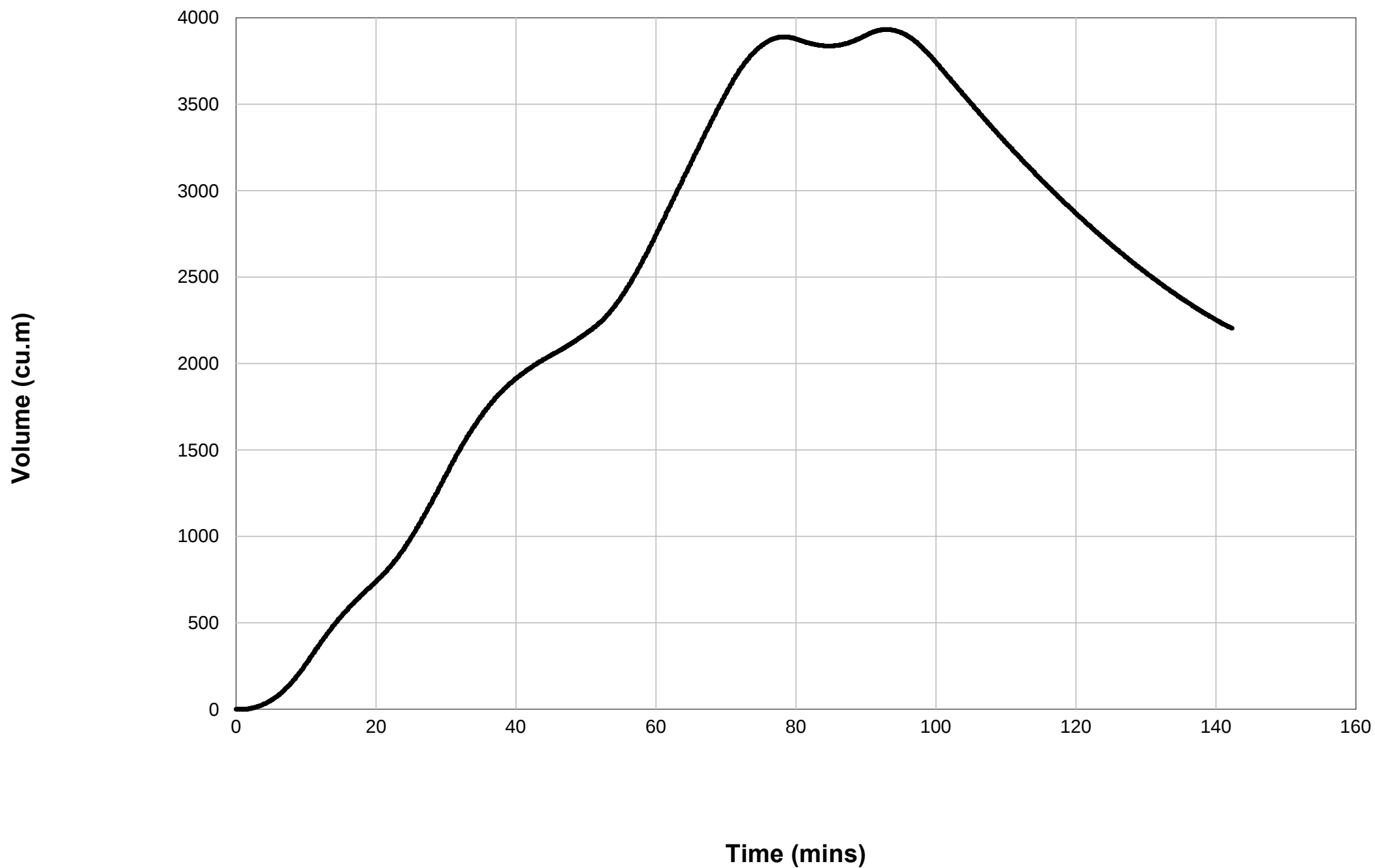
Basin Storage Volume - 20% AEP, 1 hour burst, Storm 5



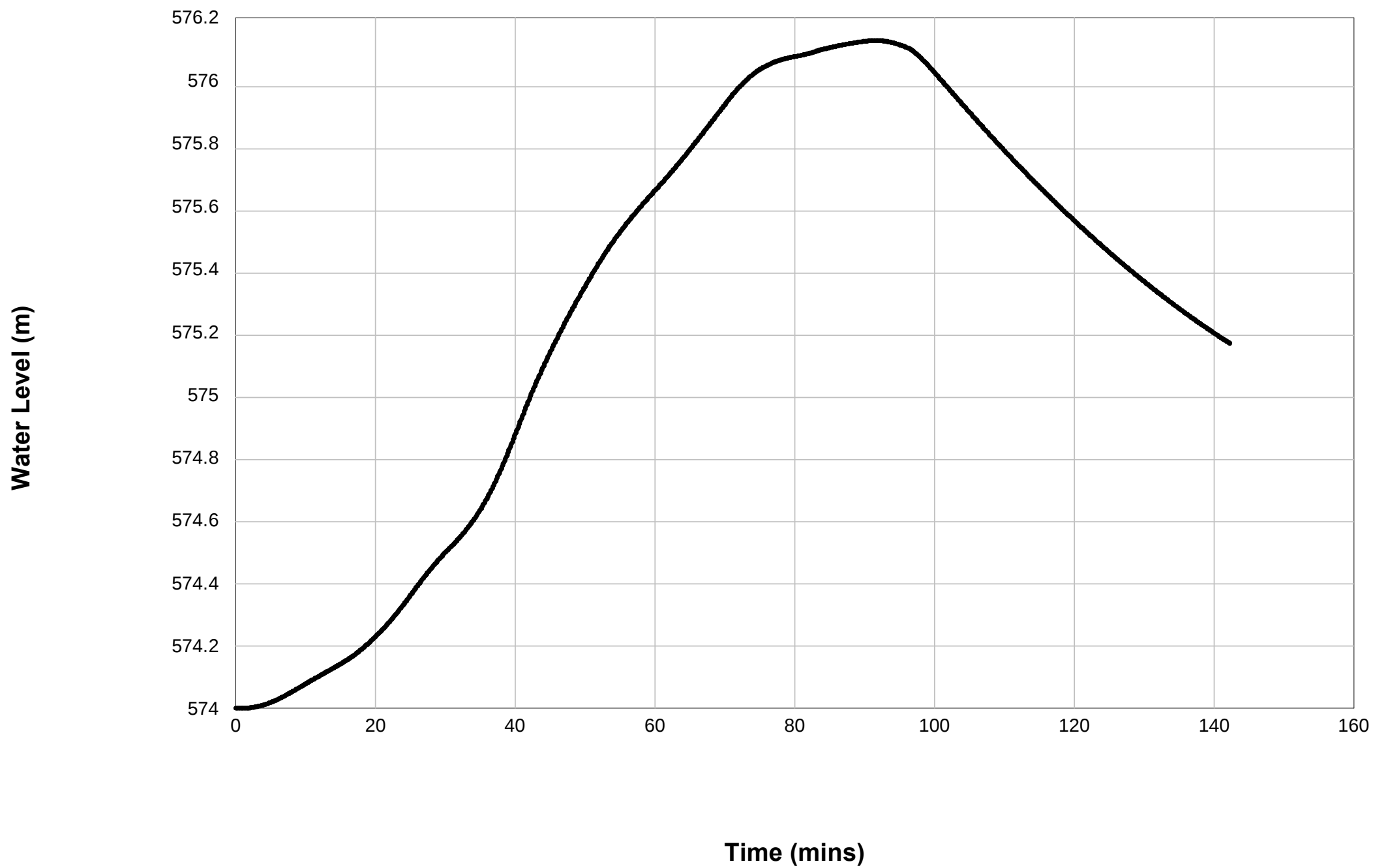
Basin Water Level - 10% AEP, 1.5 hour burst, Storm 6



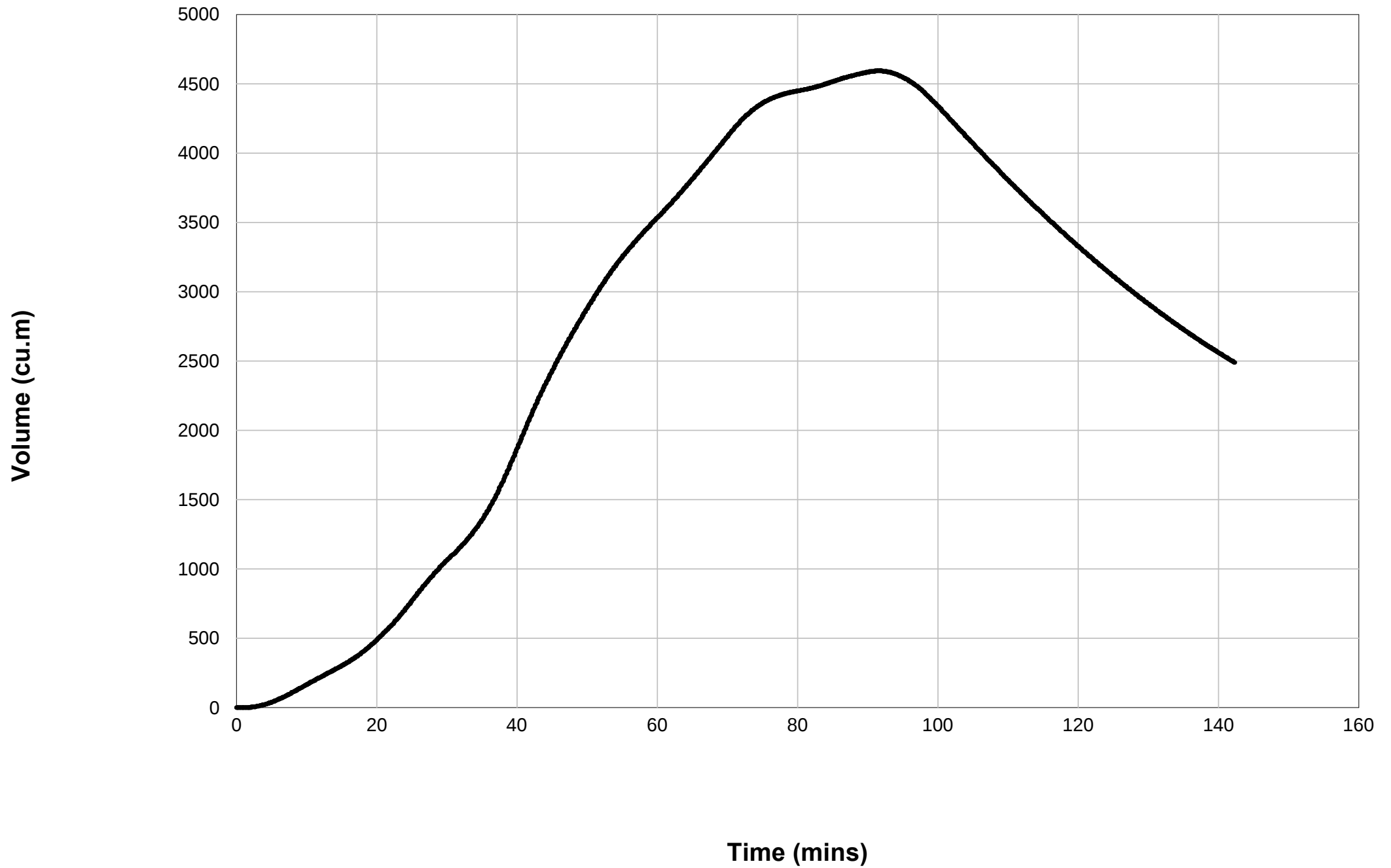
Basin Storage Volume - 10% AEP, 1.5 hour burst, Storm 6



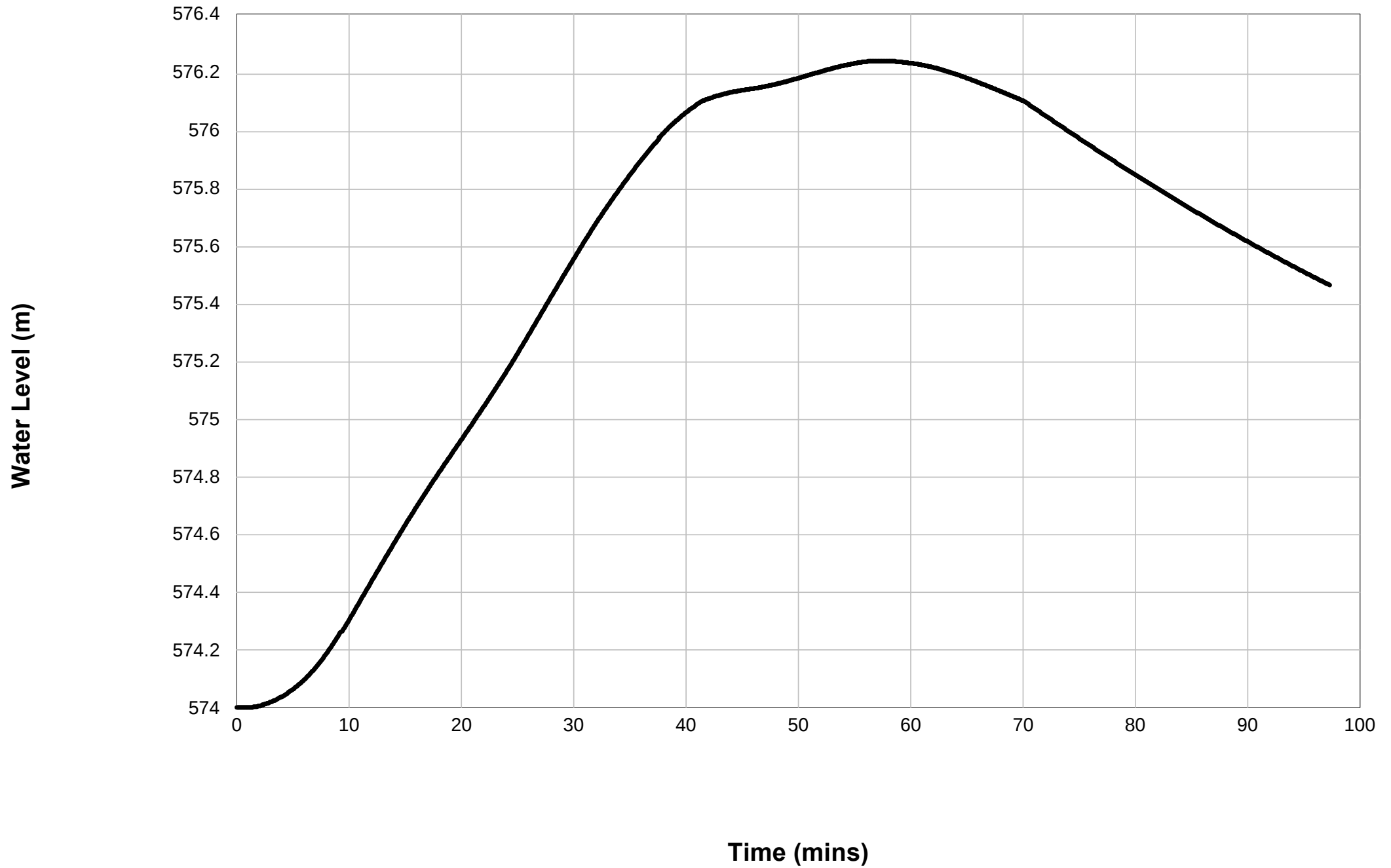
Basin Water Level - 5% AEP, 1.5 hour burst, Storm 8



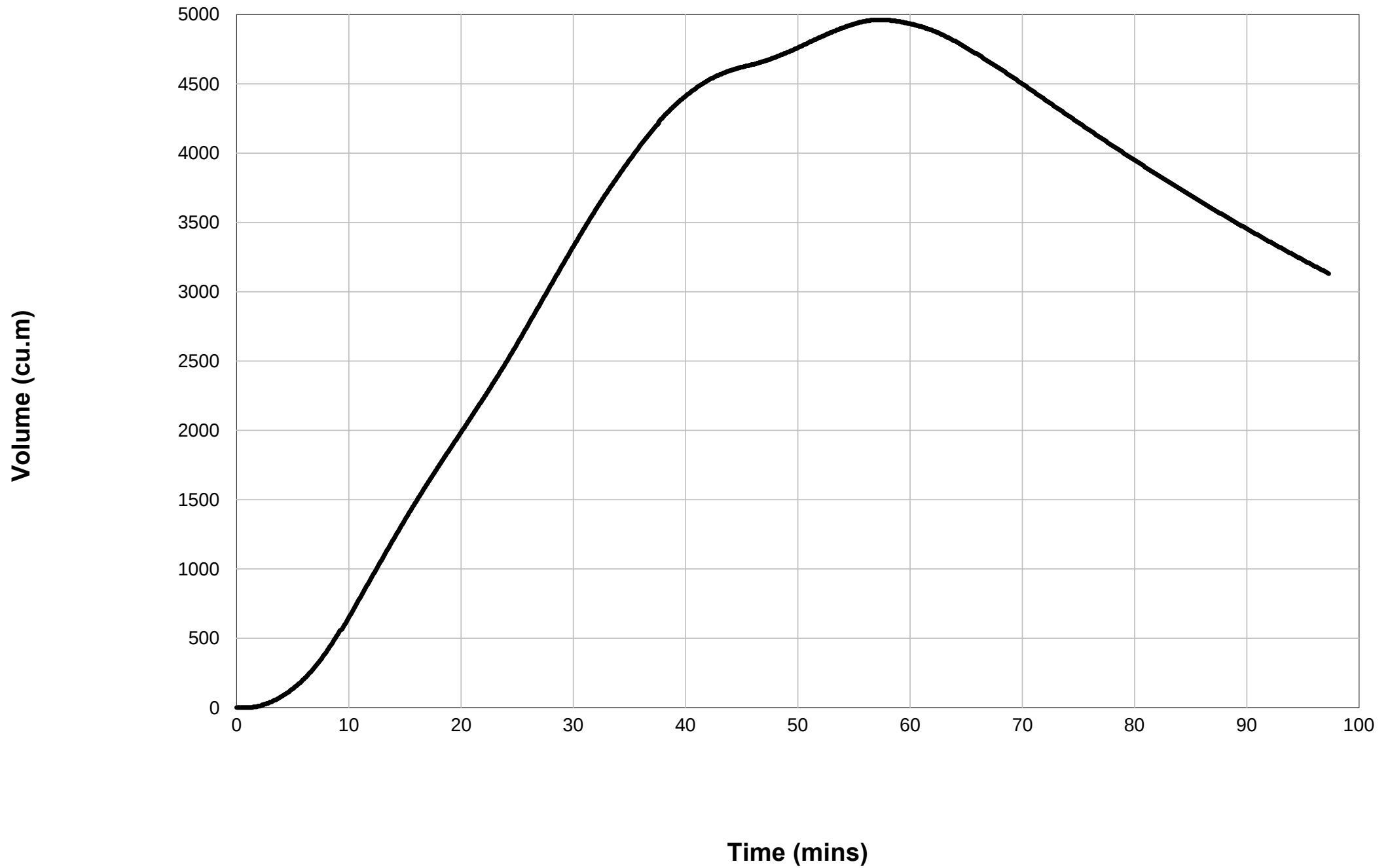
Basin Storage Volume - 5% AEP, 1.5 hour burst, Storm 8



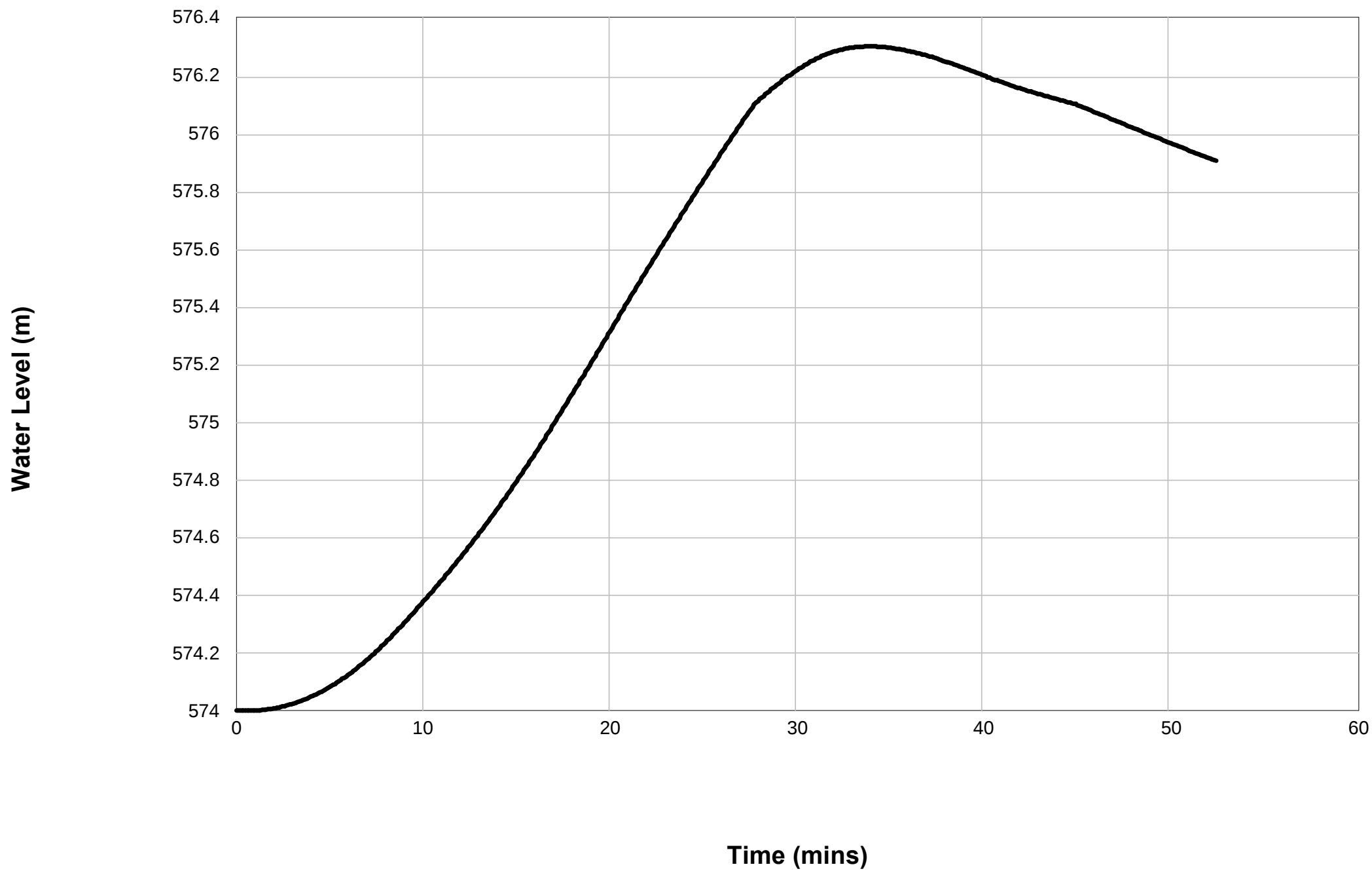
Basin Water Level - 2% AEP, 1 hour burst, Storm 3



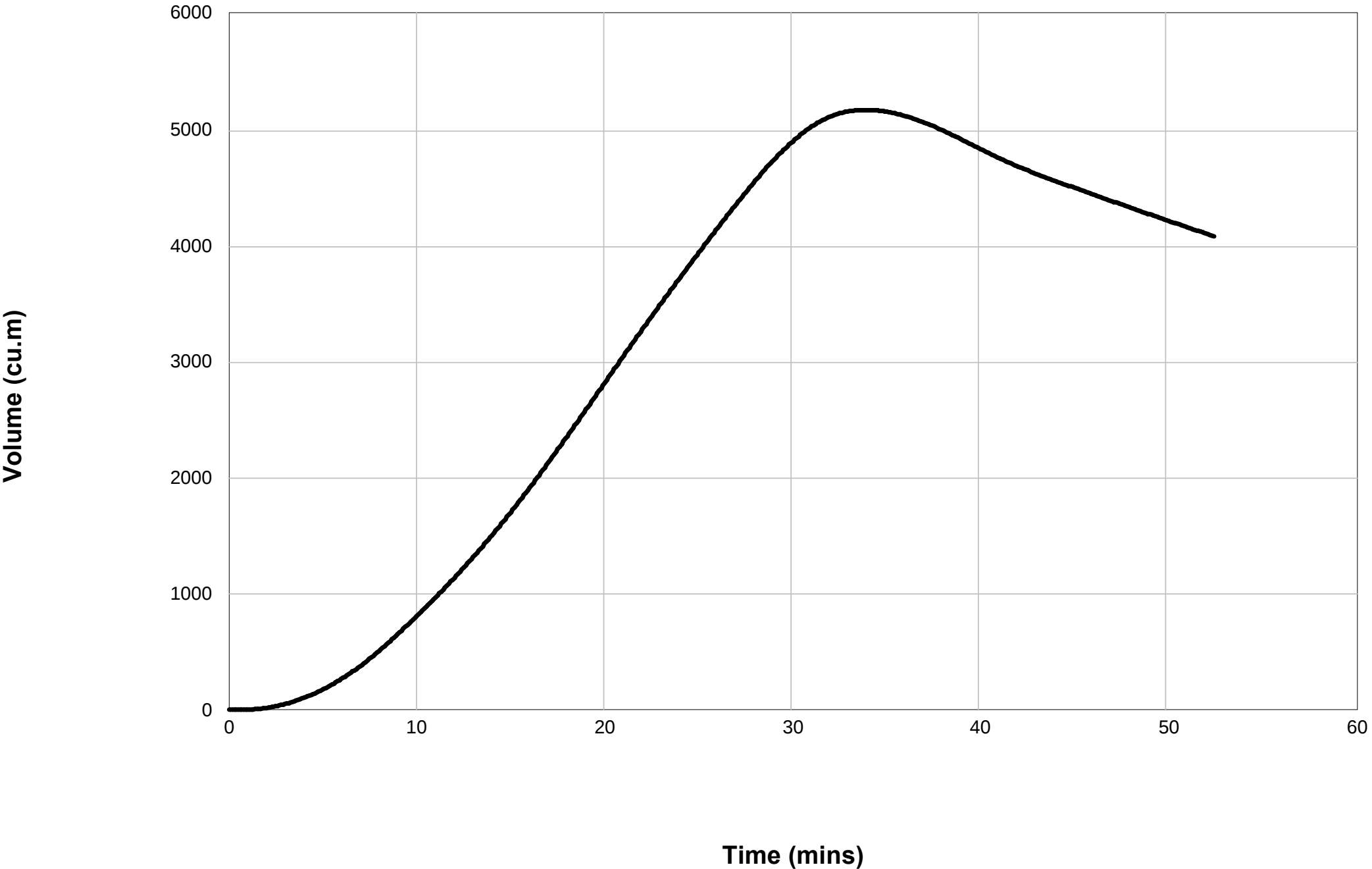
Basin Storage Volume - 2% AEP, 1 hour burst, Storm 3



Basin Water Level - 1% AEP, 30 min burst, Storm 7



Basin Storage Volume - 1% AEP, 30 min burst, Storm 7



Appendix F

Location

Label: Toowoomba

Latitude: 27.5625 [Nearest grid cell: 27.5625 (S)]

Longitude:151.9375 [Nearest grid cell: 151.9375 (E)]

IFD Design Rainfall Intensity (mm/h)

Issued: 16 November 2021

Rainfall intensity for Durations, Exceedance per Year (EY), and Annual Exceedance Probabilities (AEP).
[FAQ for New ARR probability terminology.](#)

Unit:

mm/h

 ▼

Duration	Annual Exceedance Probability (AEP)						
	63.2%	50%#	20%*	10%	5%	2%	1%
1 min	132	150	206	244	282	332	371
2 min	112	127	177	213	249	297	335
3 min	104	119	164	197	229	272	306
4 min	98.7	112	155	185	214	254	284
5 min	93.9	107	147	174	202	239	267
10 min	75.7	85.8	118	139	161	189	211
15 min	63.6	72.2	99.2	118	135	159	178
20 min	55.1	62.6	86.1	102	118	139	155
25 min	48.7	55.3	76.2	90.5	105	123	138
30 min	43.8	49.7	68.6	81.5	94.3	111	125
45 min	33.9	38.5	53.1	63.2	73.3	86.9	97.4
1 hour	27.9	31.6	43.6	52.0	60.4	71.7	80.6
1.5 hour	20.9	23.7	32.6	38.8	45.1	53.7	60.5
2 hour	17.0	19.2	26.2	31.3	36.3	43.3	48.8
3 hour	12.6	14.2	19.2	22.9	26.5	31.6	35.7
4.5 hour	9.33	10.5	14.1	16.7	19.3	23.0	25.9
6 hour	7.56	8.44	11.3	13.4	15.5	18.4	20.7
9 hour	5.64	6.28	8.38	9.87	11.4	13.5	15.2
12 hour	4.59	5.11	6.81	8.01	9.24	10.9	12.3
18 hour	3.45	3.84	5.13	6.05	6.98	8.26	9.27
24 hour	2.82	3.15	4.23	5.00	5.78	6.84	7.68
30 hour	2.41	2.70	3.65	4.33	5.02	5.94	6.67
36 hour	2.12	2.38	3.24	3.85	4.48	5.31	5.97
48 hour	1.72	1.94	2.68	3.21	3.75	4.46	5.02
72 hour	1.28	1.45	2.03	2.46	2.90	3.47	3.92
96 hour	1.03	1.17	1.64	2.00	2.38	2.86	3.24
120 hour	0.859	0.976	1.38	1.68	2.01	2.41	2.74

144 hour	0.739	0.838	1.18	1.44	1.72	2.07	2.35
168 hour	0.649	0.733	1.02	1.24	1.48	1.78	2.03

Note:

The 50% AEP IFD **does not** correspond to the 2 year Average Recurrence Interval (ARI) IFD. Rather it corresponds to the 1.44 ARI.

* The 20% AEP IFD **does not** correspond to the 5 year Average Recurrence Interval (ARI) IFD. Rather it corresponds to the 4.48 ARI.

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