

A large blue geometric graphic on the left side of the page, consisting of a triangle pointing upwards and a rectangle below it, with a diagonal cutout in the upper right corner of the rectangle.

Toddbrook Reservoir

Inspection Report under Section 10 of the
Reservoirs Act 1975 (Amended)

April 2019
Confidential

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Issue and Revision Record

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A	29/03/19	R J Robson	J R Foster	R J Robson	Draft Issue
B	30/04/19	R J Robson	T Hill	R J Robson	Final Issue

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1 Name and Situation of Reservoir, including the National Grid Reference of the Approximate Centre

Toddbrook reservoir is situated approximately 0.5km to the south-west of the town of Whalley Bridge in the High Peak area of Derbyshire 10km north of Buxton just off the A5004.

The National Grid Reference of the reservoir is SK 007 810, and the nearest postcode is SK23 7BW.

2 Name and Address of the Engineer

Richard Jonathan Robson: BSc (Hons), CEng, FICE

c/o Mott MacDonald
No1 Whitehall Riverside
LEEDS
West Yorkshire
LS1 4BN

3 Name of Panel of which the Engineer is a Member

All Reservoirs Panel.

Expiry of Certificate: 26th February 2023.

4 Name and Address of the Undertakers who Appointed the Engineer

Canal & River Trust

First Floor North

Station House

500 Elder Gate

Milton Keynes

MK9 1BB

5 Address of the Enforcement Authority

Environment Agency

Manley House

Kestrel Way

EXETER

EX2 7LQ

6 Name and Address of the Supervising Engineer

David Henthorn Brown

Canal & River Trust

Canal Lane

Hatton

Warwick

CV35 7JL.

7 Date of the Inspection

The inspection was carried out on the 14th November 2018.

8 Information Provided to the Engineer

The following reports and information were made available to the Inspecting Engineer and have been reviewed during the preparation of this report:

- Annual Statements by the Supervising Engineer (2008 to 2017)
- [REDACTED]
- Historical Drawings
- Health & Safety file for 2008 to 2011 works
- Bathymetric Survey Feb 2010
- Crest monitoring Data 1999-2018
- Mine audit drainage flow records 2015-2018
- Piezometer level records 2011-2018
- [REDACTED]
- Various Historical Journals and ICE publications
- Wave wall construction drawings
- Historical Photographs
- [REDACTED]
- Prescribed Form of Record (inc. water level spreadsheet)
- Risk Designation Letters
- Stability Report Nov 2007
- BWB mining report 1978 & drawings
- MM PMF Flood Assessment 2005 (as reported in January 2006 S10 Report Appendix B).
- Mine adit plans and sections
- Mine workings drawings
- All Statutory Inspection Reports 1944 to 2010
- Supervising Engineer Notes 2008 – 2018

9 Description of the Reservoir

9.1 General

The reservoir is situated approximately 0.5km to the south-west of the town of Whalley Bridge in the High Peak area of Derbyshire 10km north of Buxton just off the A5004.

It is orientated in a south-west to north-east direction and has a total length of approximately 1km with the main embankment being at the north-east end on the southern outskirts of Whalley Bridge. See Figure 1 below:

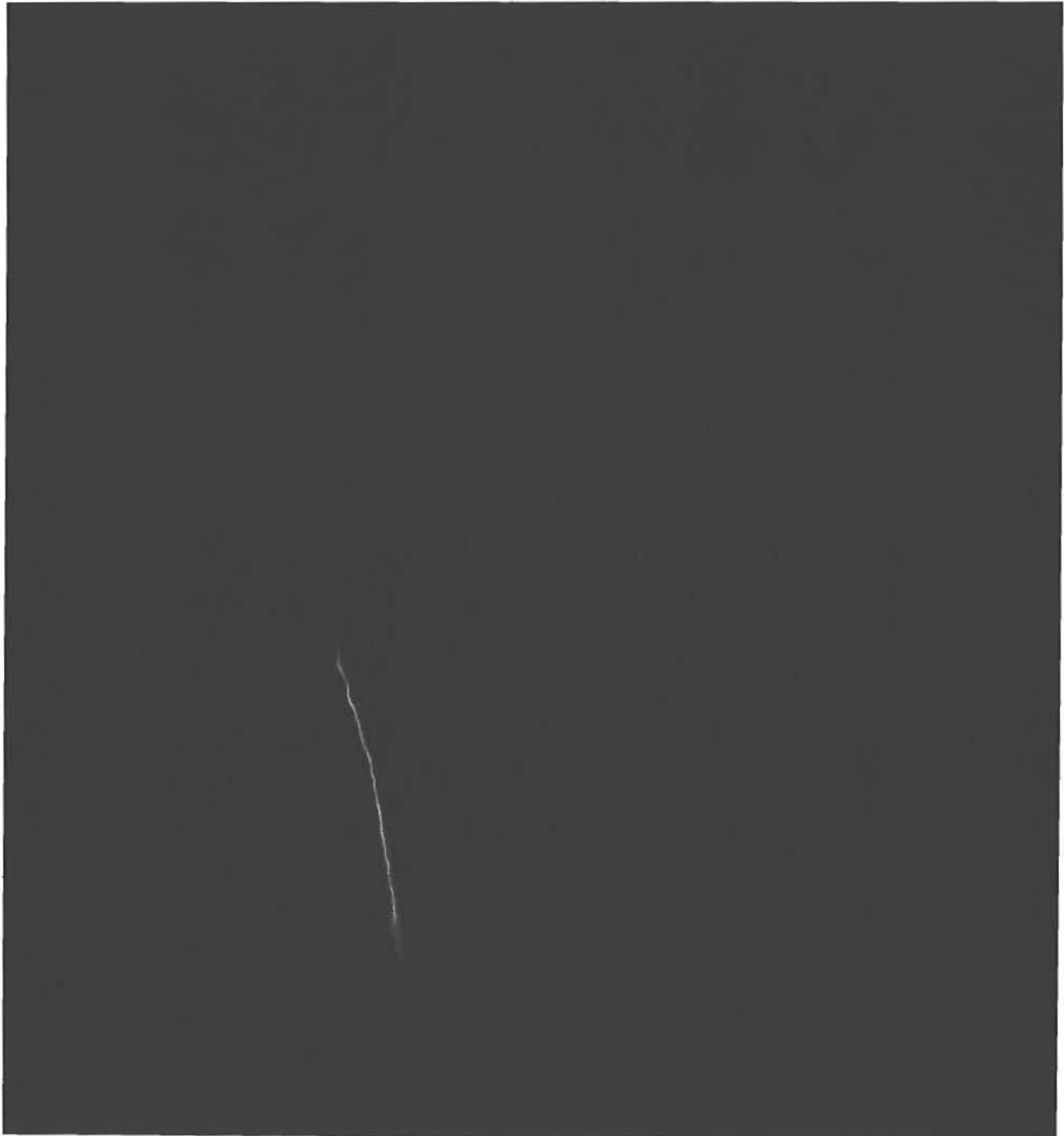
Figure 1: Location Plan



Source: Atlas WebMaps

The reservoir was designed to increase the supply to the Peak Forest Canal and was built in 1831 on the site of two smaller reservoirs built just upstream. According to the Prescribed Form of Record it has a storage capacity of 1,238,200m³ and a surface area of 0.158km² with a top water level of 185.69m AOD.

[REDACTED]



9.2 Geology

The bedrock geology for this area is the Pennine Lower Coal Measure Formation – Mudstone, Siltstone and Sandstone bedrock formed 320 million years ago in the Carboniferous Period.

The superficial geology comprises Devensian unsorted deposits and glacial tills.

The reservoir is sited on the edge of a now disused coal mining area [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]



There have been historical coal mining activities in the area for hundreds of years, [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]



[REDACTED]

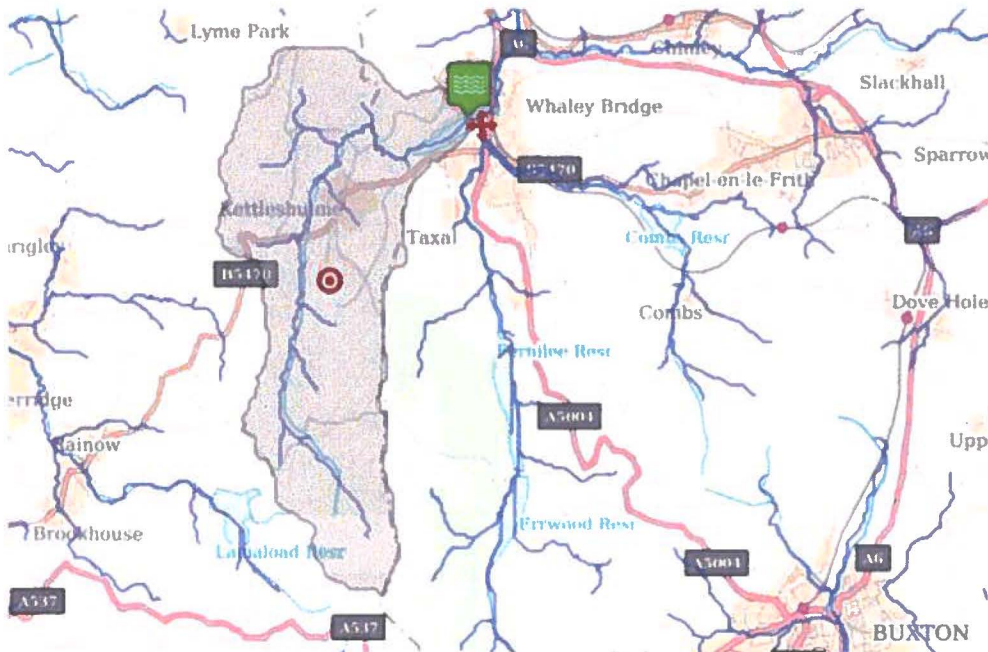
[REDACTED]

[REDACTED]

9.3 Catchment

The upstream catchment situated to the south of the reservoir is predominately rural and has an area of approximately 17.3km². The main water course being Todd Brook which flows from the south-east. The catchment has a relatively steep gradient covering a total length of approximately 8km rising from 185mAOD to over 500mAOD. See Figure 4 below: -

Figure 5: Upper Reservoir Catchment



Source: FEHWebsite

The standard annual average rainfall (SAAR) for this location is given as 1171mm per annum on the FEH Website.

There are no indirect catchment areas and the direct catchment is the only source of water to the reservoir.

9.4 Dam Details

[REDACTED]



[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

The embankment is straight in plan and is approximately 310m long. At the centre of the valley it has a maximum height of 23.8m (below the average crest level of 187.3mAOD). [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

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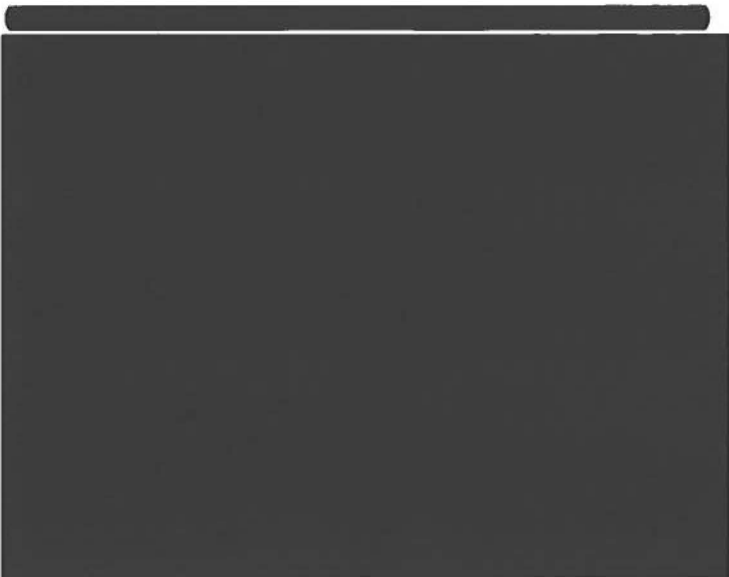
[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]



[Redacted text block containing multiple lines of text, some bulleted, and several paragraphs. The text is obscured by black bars.]



[Redacted line of text]

[Redacted line of text]

[Redacted line of text]



[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

9.9 Instrumentation

The instrumentation provided at this reservoir comprises V-notches to measure drainage flows and piezometers to record borehole water levels in the embankment. Concrete level steps on the upstream face are used for manually recording water depths (which are also recorded on SCADA). The previous level recording equipment on the weir in the primary overflow channel to the rear of the reservoir cottage is now redundant.

9.9.1 Drainage flow measurement

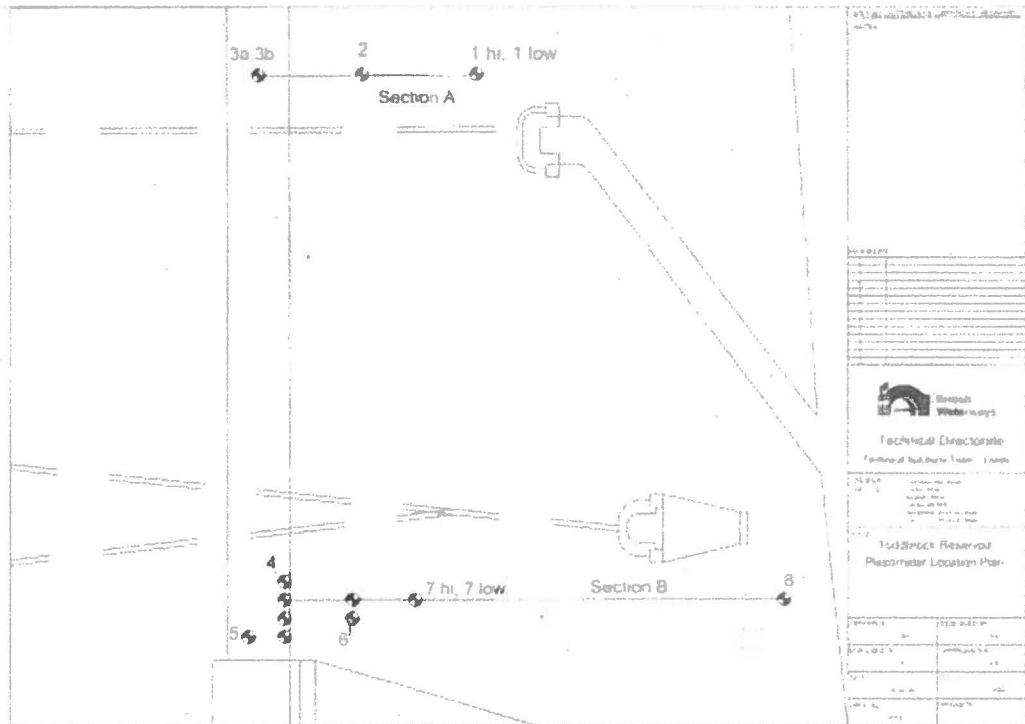
Flows are measured by mean of V-notches

9.9.2 Piezometers

Piezometers are located on the two lines used for the slope stability analysis

as shown in Figure 15 below: -

Figure 15: Piezometer locations



Source: CRT Records

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

10 Condition of the Reservoir

10.1 General

The Inspection was completed on 14th November 2018 in the company of the Supervising Engineer David Brown and the following personnel from the Undertaker the Canal & River Trust.

██████████ Senior Asset Engineer (and Trainee Supervising Engineer) from the Engineering Team in Wigan, ██████████ Principal Geotechnical Engineer (and Trainee Supervising Engineer).

██████████ from the Operational Team based at Kidsgrove, who does the twice weekly surveillance and monitoring. ██████████ (Volunteer) who assists the Operational Team.

The weather was dry and bright, and the ambient temperature was over 12°C. Despite the overnight rain the inspection followed a prolonged summer dry spell, so the ground underfoot was firm.

The reservoir was just over 4m below top water level.

The Inspection commenced with a full walk-over ██████████

██████████
██████████
██████████
██████████
██████████
██████████
██████████
██████████
██████████
██████████

Photographs of the conditions found are contained in Appendix A. CRT record photographs ██████████
██████████ can be found in appendix B.

10.2 Catchment

A comparison of the catchment area (Figure 5) together with the latest satellite images shows that there have been no significant changes to the condition of the catchment area in the last 10 years since the last Inspection.

10.3 Embankment

Overall the embankment appeared in good condition and corresponded to the line, levels and gradients shown on the drawings ██████████

[REDACTED]

10.3.3 Downstream Face

The downstream face has full grass coverage and was firm underfoot on the slope, at the toe and down both mitres, [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

10.3.5 Services

There are no known services in the embankment or crest.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

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[Redacted]

[Redacted]

[Redacted]

[REDACTED]

10.8 Instrumentation

The instrumentation available on site consists of the V-notch measurement weirs [REDACTED] and the piezometers [REDACTED]

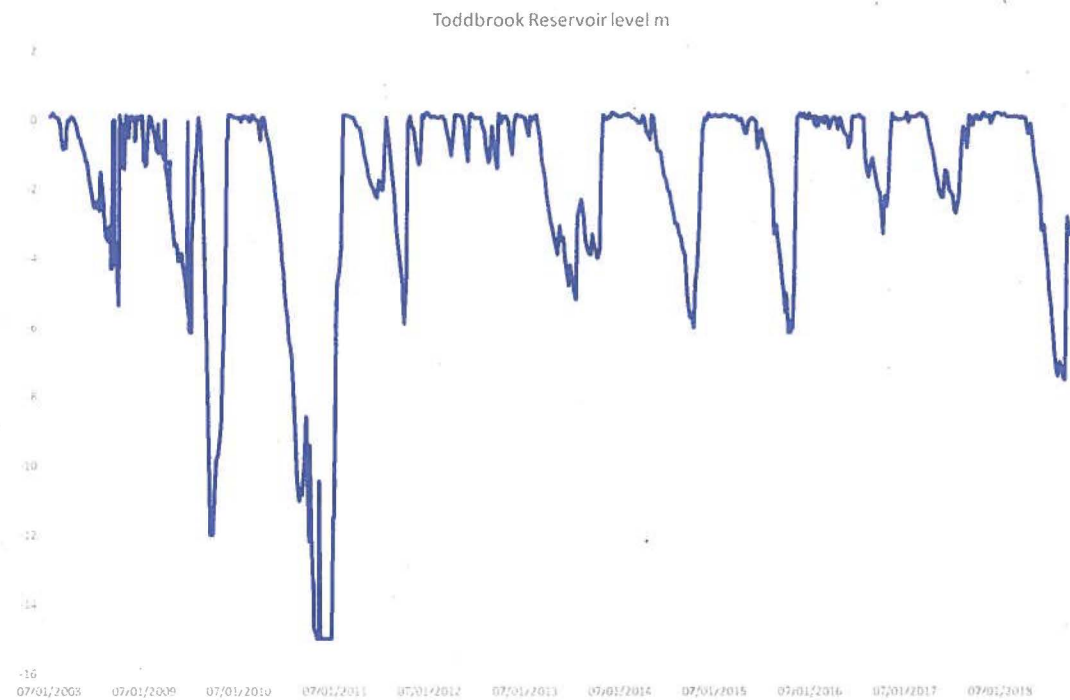
These are described in the above Sections 9.9.1 and 9.9.2 respectively.

[REDACTED]

10.9 Method of recording water levels

Water levels are taken manually on a weekly basis [REDACTED] These are entered into the Supervising Engineers spreadsheet and are part the Prescribed Form of Record. [REDACTED]

Figure 18: Water level records 2008 - 2018



Source: CRT SE data

It can be seen that the reservoir water levels drop to 5-6m below TWL most summers with the exception of 2009 and 2010 where levels dropped to 12 and 15m below TWL respectively.

[REDACTED]

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11 Adequacy of the Dam and Associated Works

[REDACTED]

[REDACTED]

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[illegible]

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[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] [REDACTED]

[REDACTED]

[REDACTED]

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[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]

[Redacted text block]

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12.1 Correctness of Particulars in the Prescribed Form of Record

The Prescribed Form of Record for the reservoir is being kept up to date by the Undertaker and has been amended to reflect the change in structure required by statutory instrument SI1677:2013.

Table 3: Comments on Prescribed Form of Record

Part	Description	Comment
1	Water Levels	No comment
2	[REDACTED]	[REDACTED]
3	Persons under Act	Inspecting Engineer address changed in Jan 2019
4	[REDACTED]	[REDACTED]
5	Access capacity	No comment
6	Dam details	No comment
7	Catchment details	No comment
8	Spillway works	No comment
9	MITIORS	No comment
10	Supervising Eng Directions	No Entries
11	Unusual events	No comment
12	Certificates	No comment
13	Reuse,abandonment,discon	No Entries
14	Drawing register	No comment
15	Instrumentation	[REDACTED]
15	Valve operations	No comment

Source: Robson 2018

Toddbrook reservoir has been given a final designation of High Risk and the CRT are now completing an electronic version of the new Prescribed Form of Record, split into two parts with Part 1 containing the weekly water level records. **With the exception of the comments in bold made in the above table the records are correct and comprehensive.**

12.2 Water Level monitoring

Water level monitoring is carried out manually on a weekly basis [REDACTED]

12.3 Crest Level Monitoring

Crest level monitoring is carried out on an annual basis at this reservoir. [REDACTED]

12.4 Reservoir Surveillance

The Undertaker advised that the Supervising Engineer currently visits the reservoir at least twice a year and that surveillance visits are undertaken twice a week by operational staff. A record is

kept showing that the surveillance visits have been undertaken, and these are reviewed by the Asset Engineer and anomalies relayed to the Supervising Engineer.

The level of supervision and surveillance visits are judged as being appropriate to the hazard and risk posed by the reservoir and it is recommended that they should continue at these frequencies.

[REDACTED]

13 Findings and Recommendations of the Engineer

13.1 Scope of Statutory Inspection

The Inspecting Engineer has formed a general opinion of the overall condition of the reservoir. In accordance with normal practice on a periodical inspection under the Reservoirs Act [REDACTED]

[REDACTED]

[REDACTED] His opinion is based on his observations on the date of the site visit, examination of the data supplied to him and discussions with the representatives of the Undertaker.

13.2 Findings

My findings as a result of this inspection are that: -

- a. Toddbrook is a large reservoir situated in High Peak area of Derbyshire and operated by Canal & River Trust. It has a 23.8m high earth embankment [REDACTED] and is located in a steep sided valley immediately upstream of the town of Whalley Bridge.
- b. The reservoir was built in 1831 and has therefore been in existence for nearly 190 years and was constructed for supplying water to the Peak Forest Canal.

- c. [REDACTED]
[REDACTED]
- d. [REDACTED]
[REDACTED]
- e. The reservoir works and the embankment are generally adequately maintained in satisfactory condition.
- f. [REDACTED]
[REDACTED]
- g. [REDACTED]
[REDACTED]
- h. [REDACTED]
[REDACTED]
[REDACTED]
- i. [REDACTED]
[REDACTED]
[REDACTED]
- j. The downstream face of the embankment has been shown to have an adequate factor of safety, [REDACTED]
- k. There are no significant changes in the catchment or downstream conditions since the previous Inspection in 2010
- l. The CRT have a pro-active attitude to reservoir safety and their record keeping and supervision is very good.

[REDACTED]
[REDACTED]

[REDACTED]

[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED] [REDACTED] [REDACTED]
[REDACTED] [REDACTED] [REDACTED] [REDACTED]	[REDACTED]	[REDACTED]	[REDACTED] [REDACTED]
[REDACTED] [REDACTED] [REDACTED] [REDACTED]	[REDACTED]	[REDACTED]	[REDACTED] [REDACTED] [REDACTED] [REDACTED]

- [REDACTED]
- [REDACTED]
- [REDACTED]

• [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

13.3 Statement in Relation to Previous Measures to be Taken in the Interests of Reservoir Safety

There were two measures to be taken in the interests of reservoir safety recommended in the previous Inspection carried out in 2010.

• [REDACTED]

[REDACTED]

[REDACTED]

• [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Both these recommendations were signed-off by the previous Inspecting Engineer Tim Hill in his 10.6 certificate dated 19th March 2012.

• [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

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[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[illegible]

The following matters relating to the safety of personnel and public were noted: -

- (i) Lack of fencing
- (ii)
- (iii)

It is recommended that the Supervising Engineer should visit the reservoir on at least two occasions each year, i.e. within a period of 12 calendar months, varying the time of inspections from year to year so that the reservoir is inspected under different conditions.

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- b) On the new pins to be installed [REDACTED] at a frequency of not less than once every 12 months, (but initially 6 months for a period of 2 years).
- c) On crest pin SP04 at frequency of not less than 6 months (for next 2 years).
- (iii) [REDACTED]
[REDACTED]
- (iv) Flows from all the following points to be measured and recorded at weekly intervals.
 - a) [REDACTED] drainage V-notch.
 - b) [REDACTED] drainage V-notch.
- (v) Flows from all the following points to be measured and recorded at monthly intervals.
 - a) [REDACTED] V-notch
 - b) [REDACTED] V-notch [REDACTED]
 - c) [REDACTED]
- (vi) Water levels from the piezometer boreholes to be recorded [REDACTED]
[REDACTED]
[REDACTED]
- (vii) All other [REDACTED] to be monitored by the Supervising Engineer on his regular visits.

[REDACTED]
[REDACTED]
[REDACTED]

All the above results involving flows and water levels to be plotted against rainfall and reservoir level to aid interpretation.

13.10 Recommendation as to the date of the next statutory inspection

I recommend that a further inspection of the reservoir be carried out by an Inspecting Engineer not later than 13th November 2028.

14 Signature of Engineer:





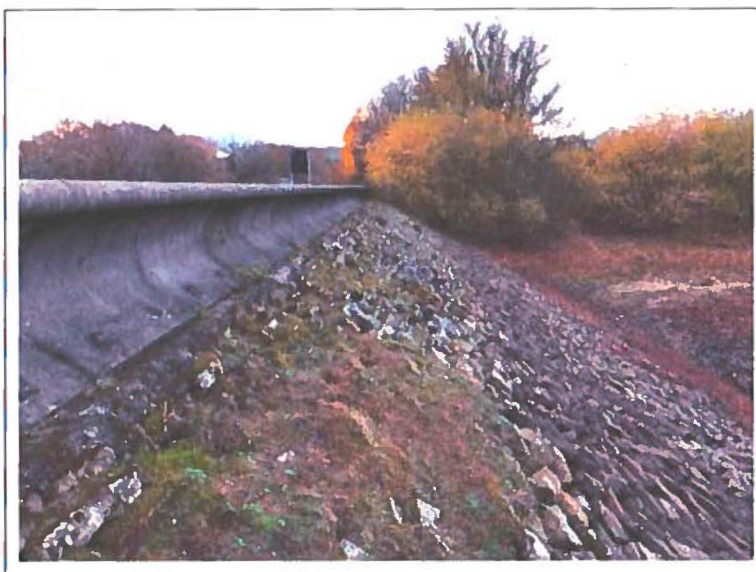

Date of Report: 30th April 2019



Appendices

A.	Photographs of the reservoir taken on 14 th November 2018	50
B.	CRT Record Photographs	92
C.	Inspecting Engineer's Certificate issued under Section 10(5) of the Reservoirs Act	95

A. Photographs of the reservoir taken on 14th November 2018

 A photograph showing a grassy embankment in the foreground, with a line of trees in the middle ground. In the background, a reservoir is visible under a cloudy sky. The trees have some autumnal colors.	<p>1 – General view of embankment looking upstream</p>
 A photograph of a reservoir looking upstream. The water is calm with some ripples. The far bank is covered in dense trees and vegetation. The sky is overcast with grey clouds.	<p>2 – General view of reservoir looking upstream</p>

 A photograph showing a close-up view of a dam's upstream pitching. The pitching is made of dark, irregular stones and is covered with patches of green moss and small plants. The background shows a line of trees with autumn foliage in shades of orange and yellow.	<p>3 – Upstream pitching right-hand mitre</p>
 A photograph showing a wide view of the upstream pitching of a dam. The pitching is made of dark, irregular stones and is covered with patches of green moss and small plants. The background shows a line of trees with autumn foliage in shades of orange and yellow.	<p>4 – Upstream pitching from right-hand mitre</p>

	<p>5 – Upstream pitching</p> <p>[REDACTED]</p> <p>[REDACTED]</p>
	<p>6 - Upstream pitching mid bank</p>



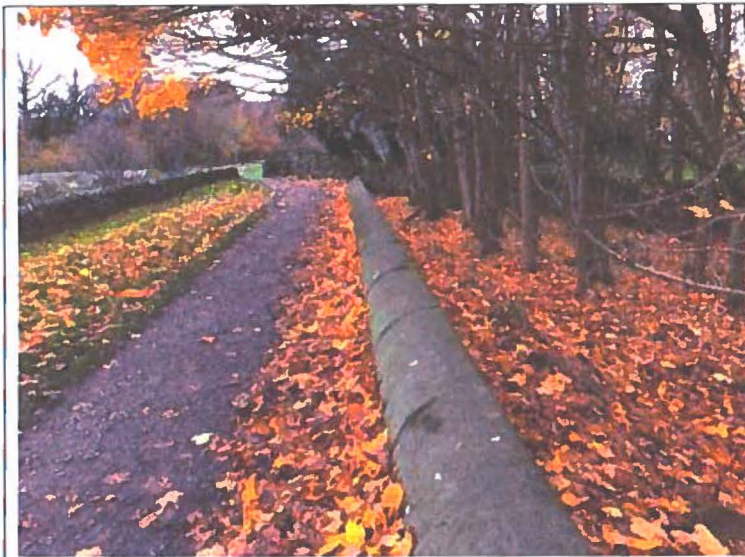
8 – Depth marker steps



9 – Upstream pitching
looking towards left-hand
mitre



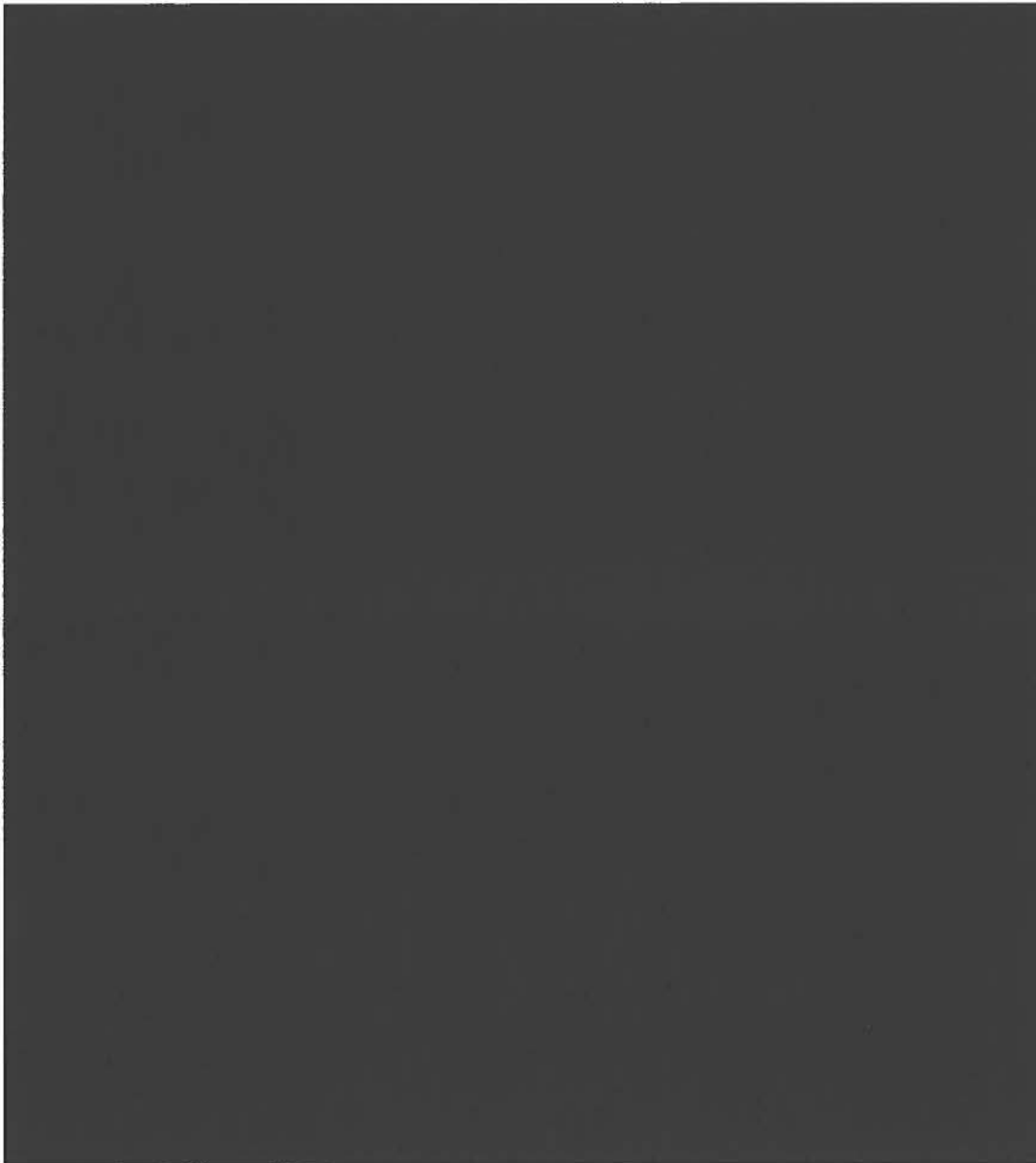
10 – Upstream approach
wall [REDACTED]
[REDACTED]

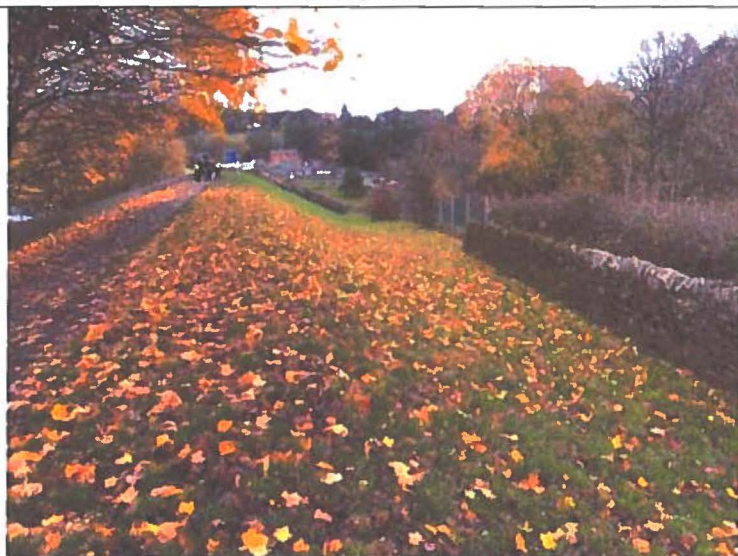
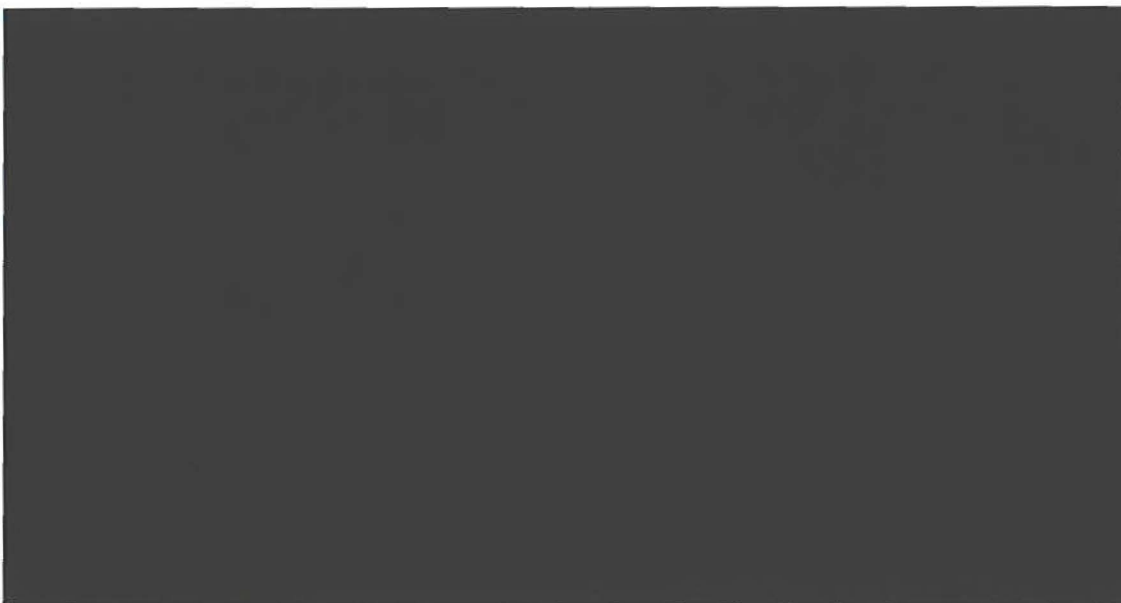


11 – Wave wall right-hand abutment





12 – General view of crest from right-hand abutment





16 – Downstream face
from right-hand abutment

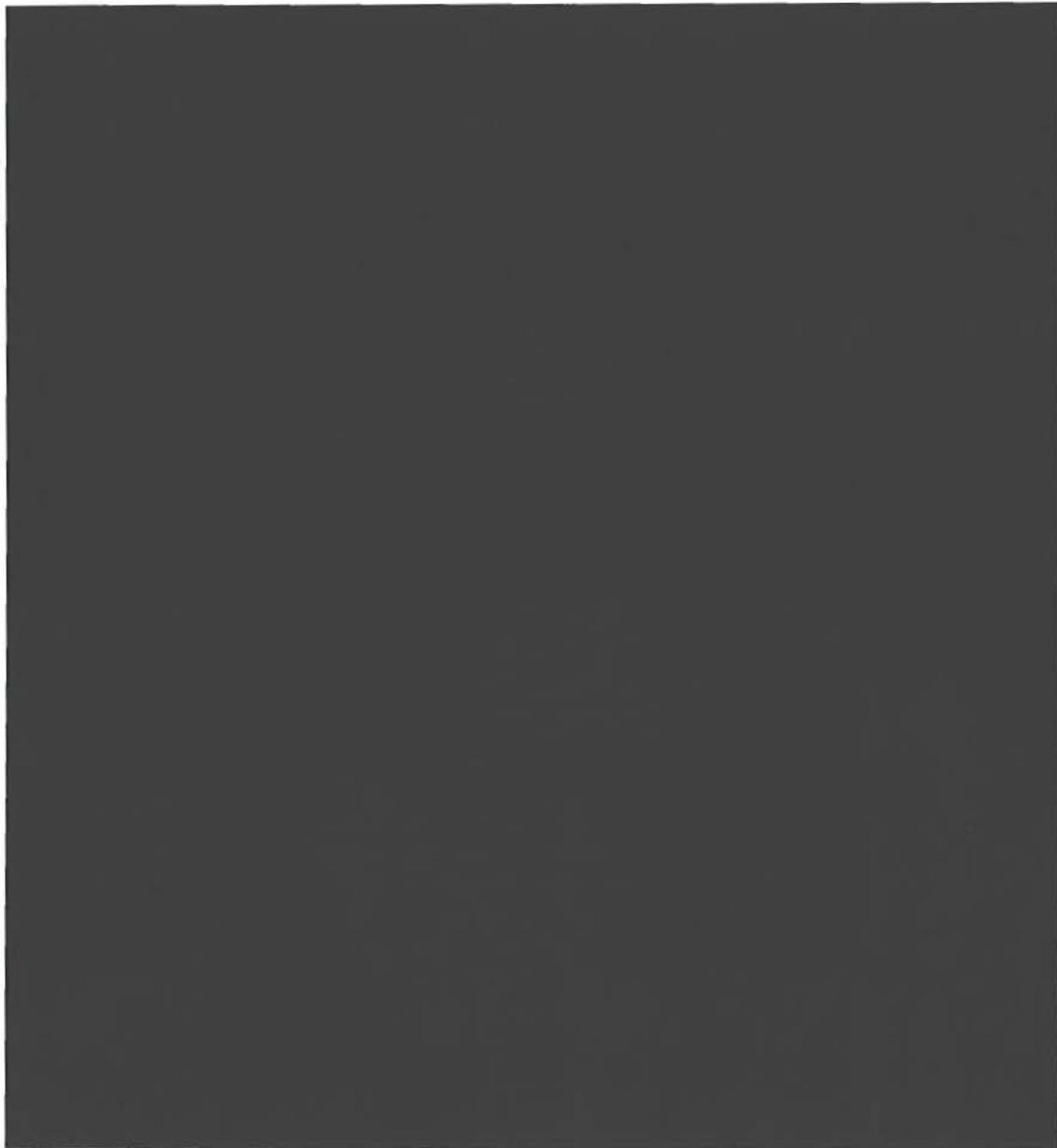
	17 – Downstream face from right-hand mitre
	18 – [REDACTED] right- hand mitre

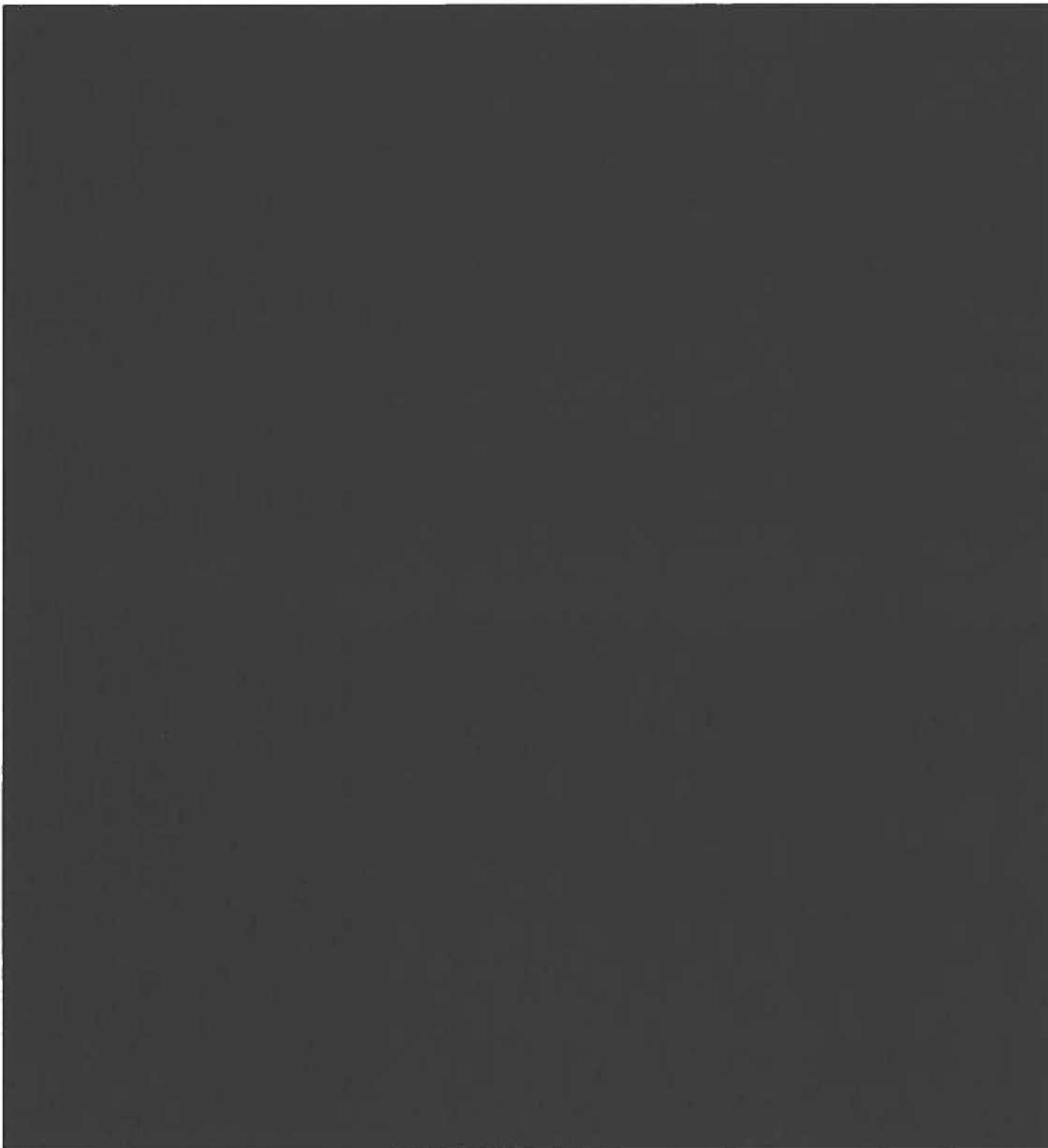
	<p>19 – Downstream face mid bank</p>
	<p>20 – Downstream face [REDACTED] [REDACTED]</p>

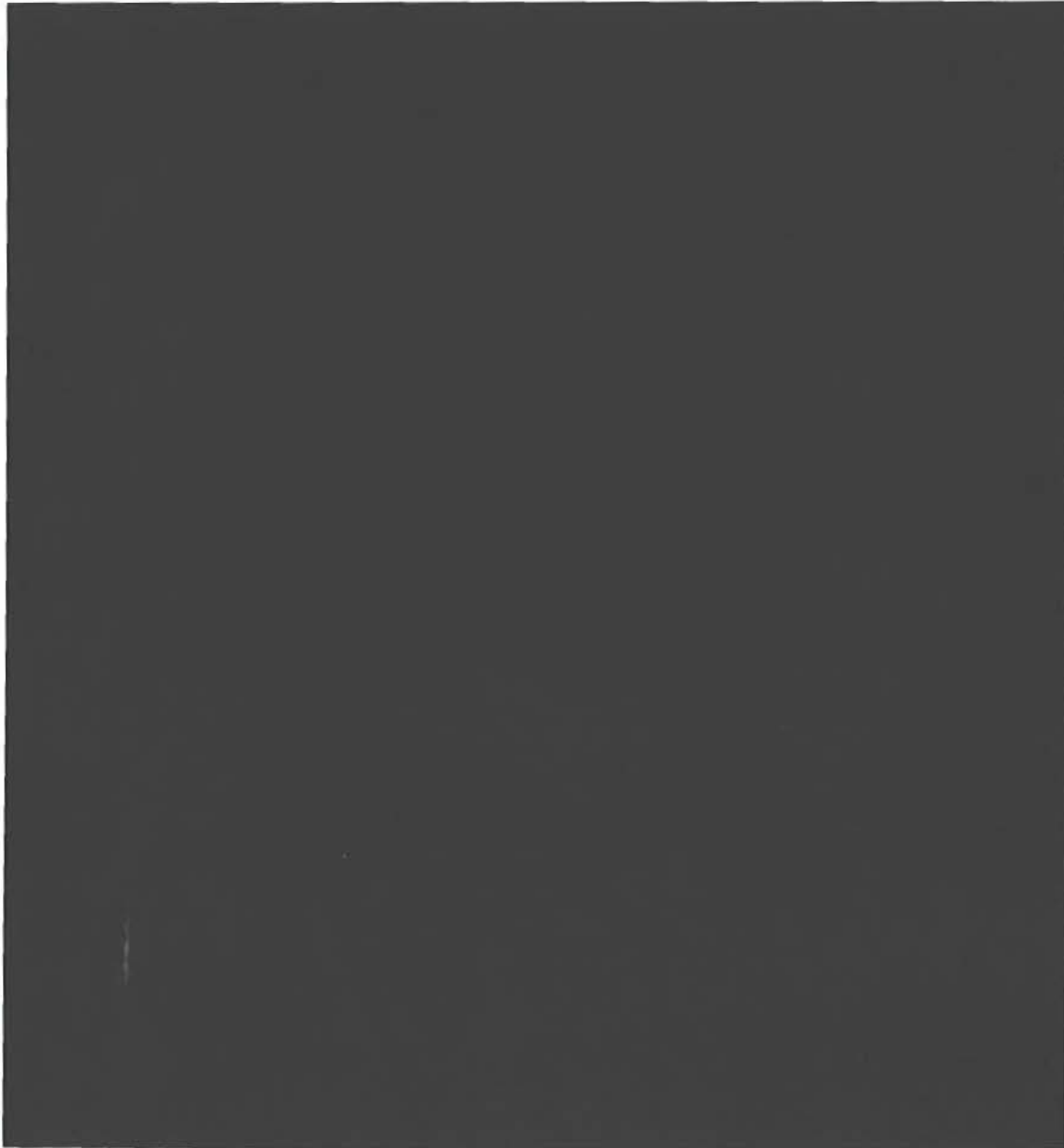


21 – Downstream face
and left-hand mitre





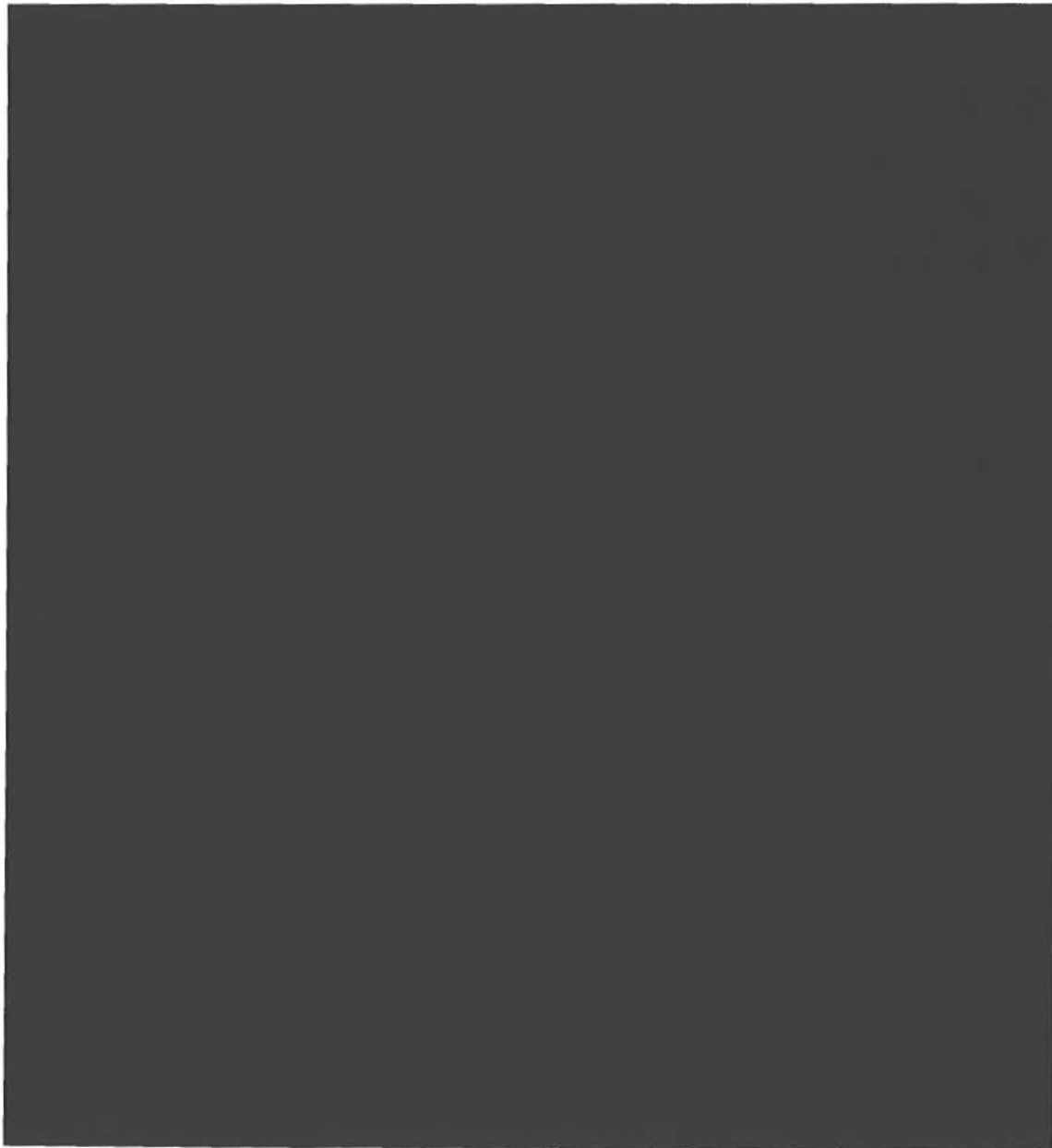


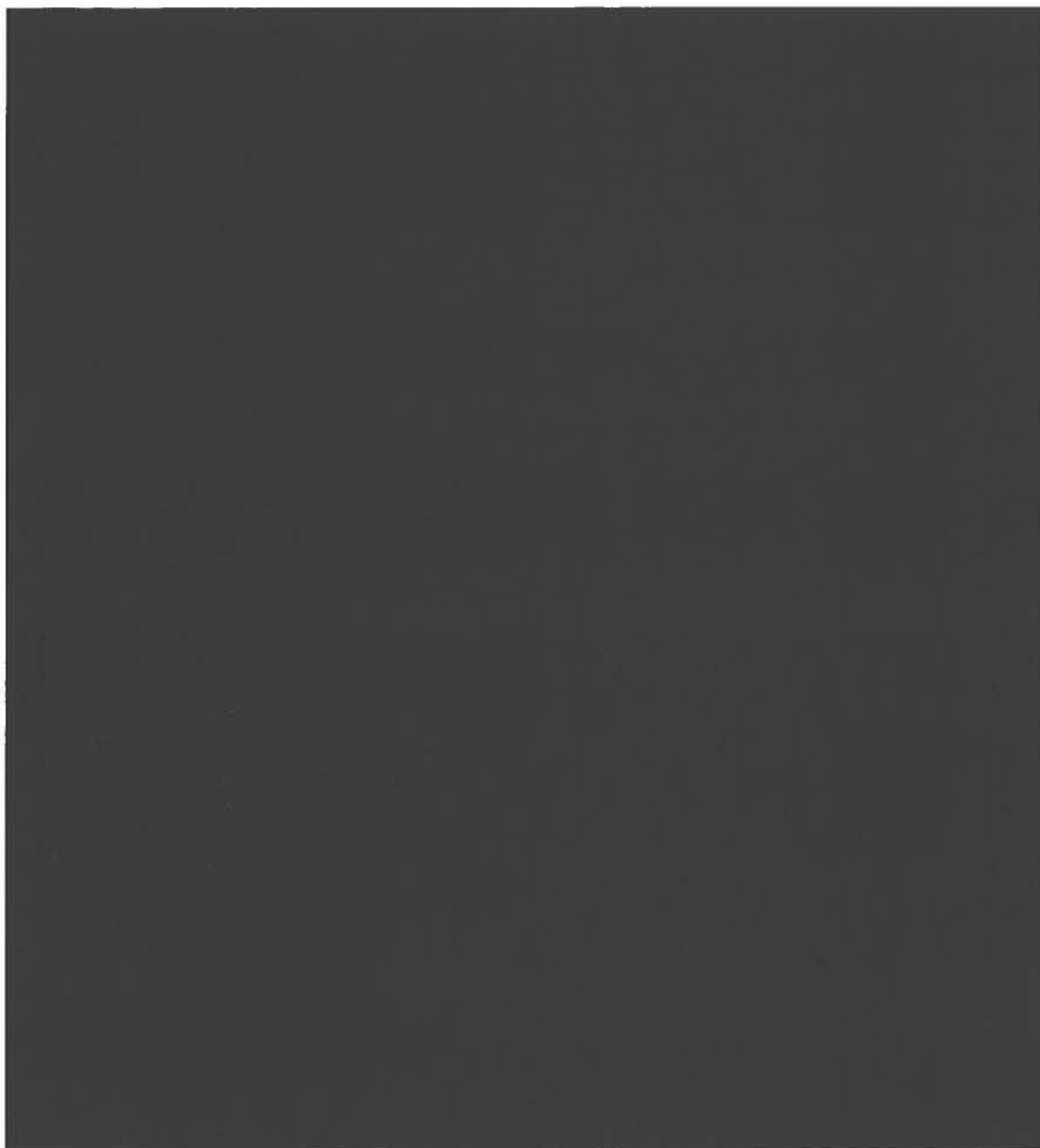


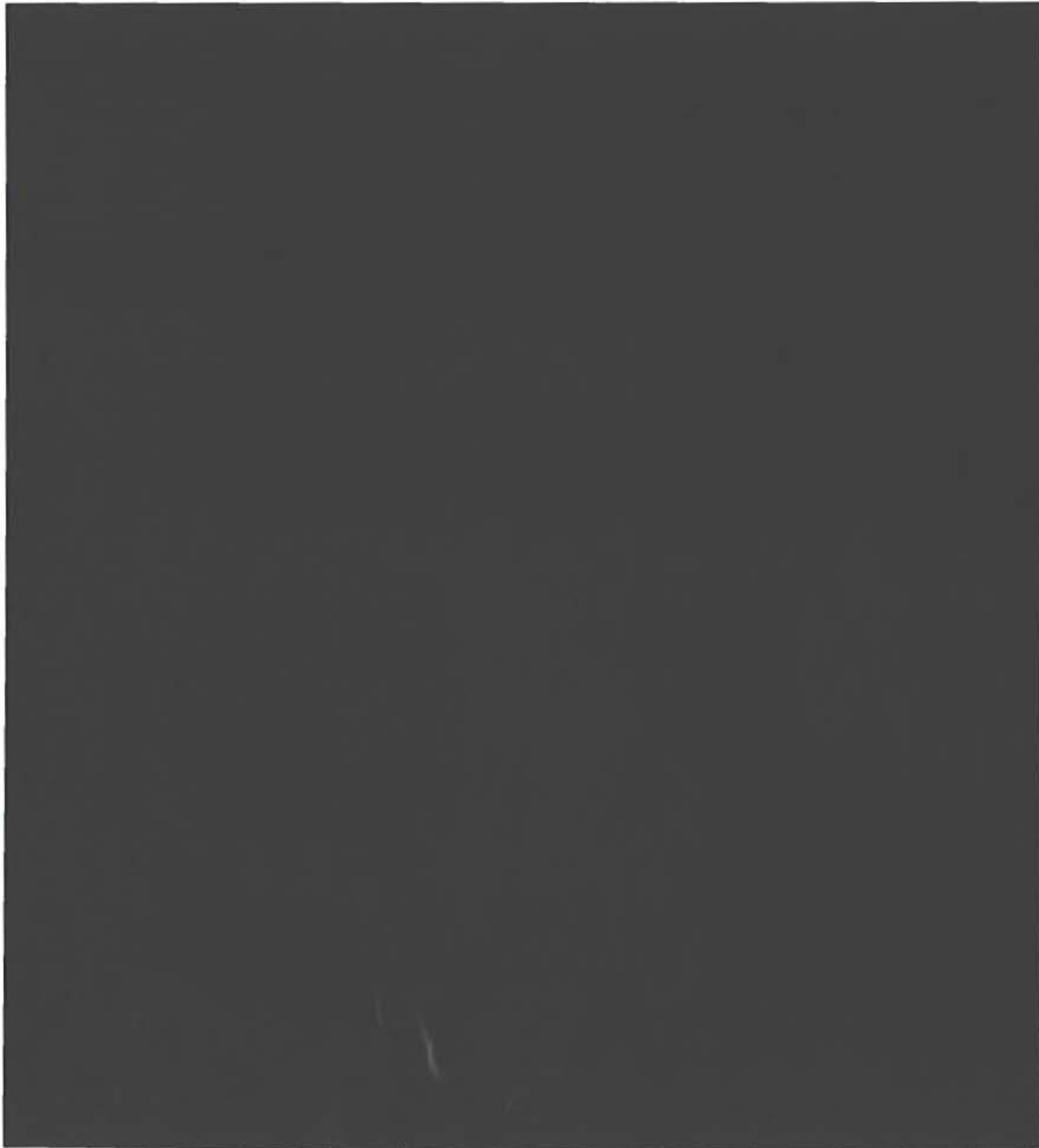


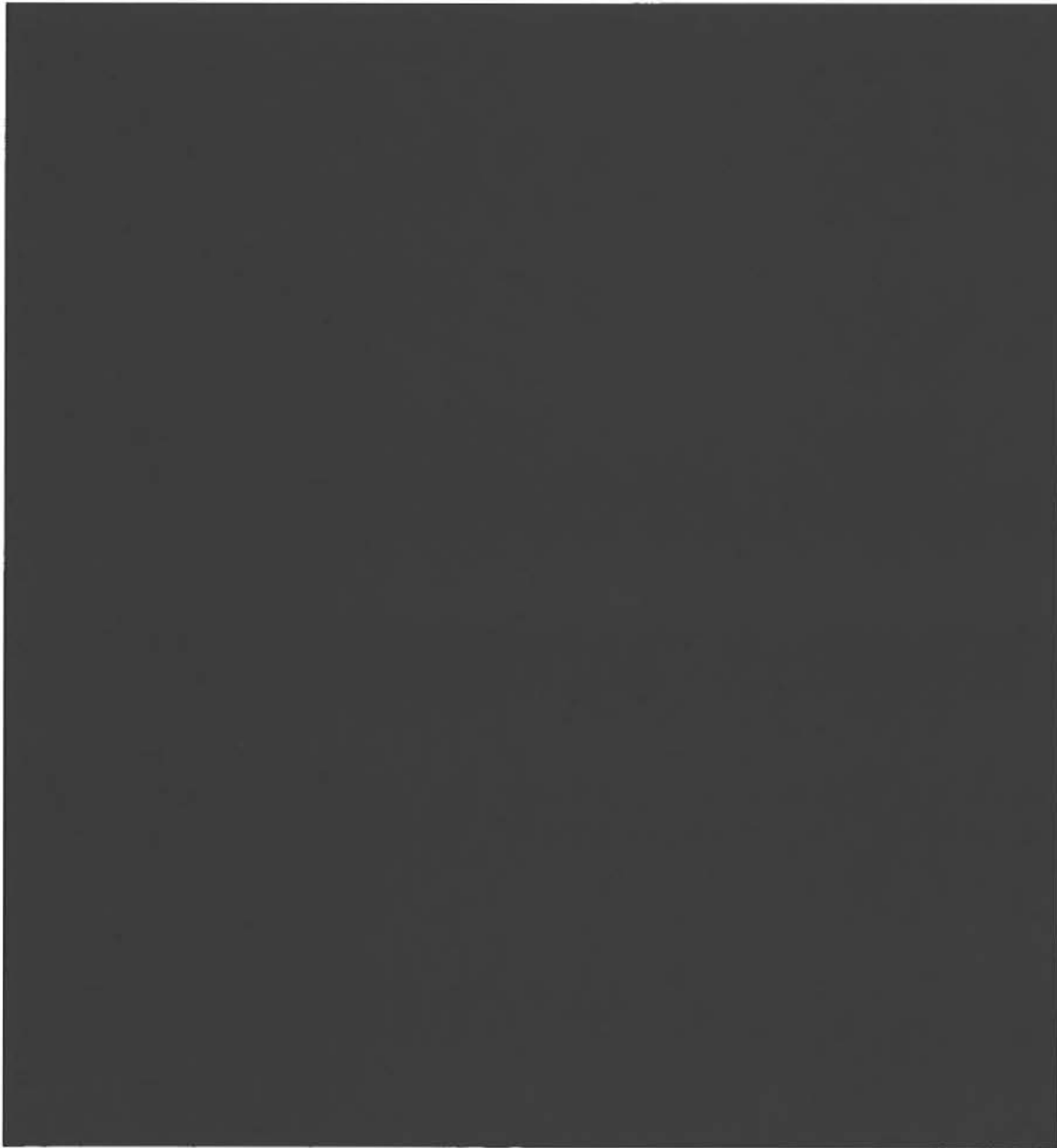


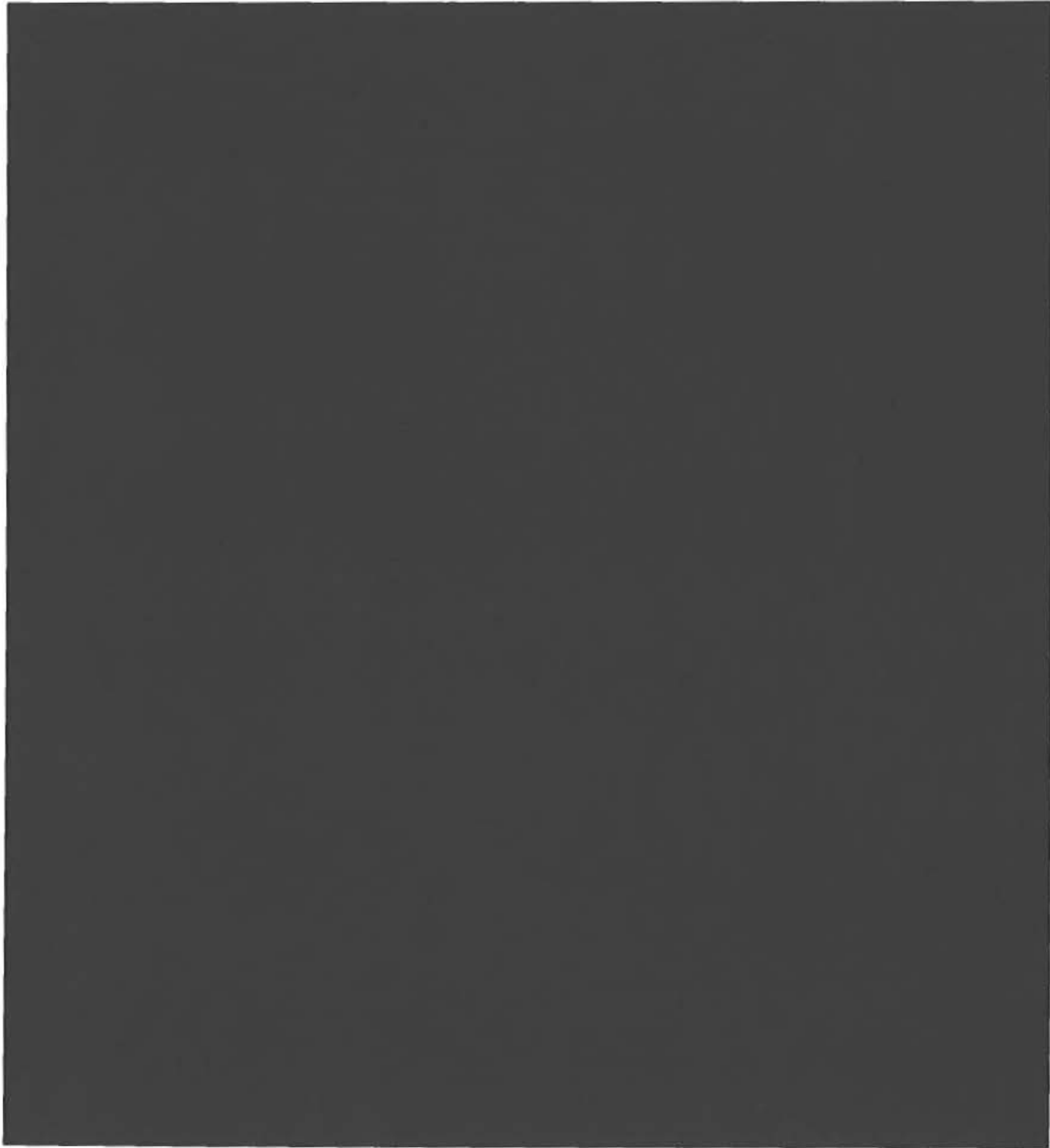


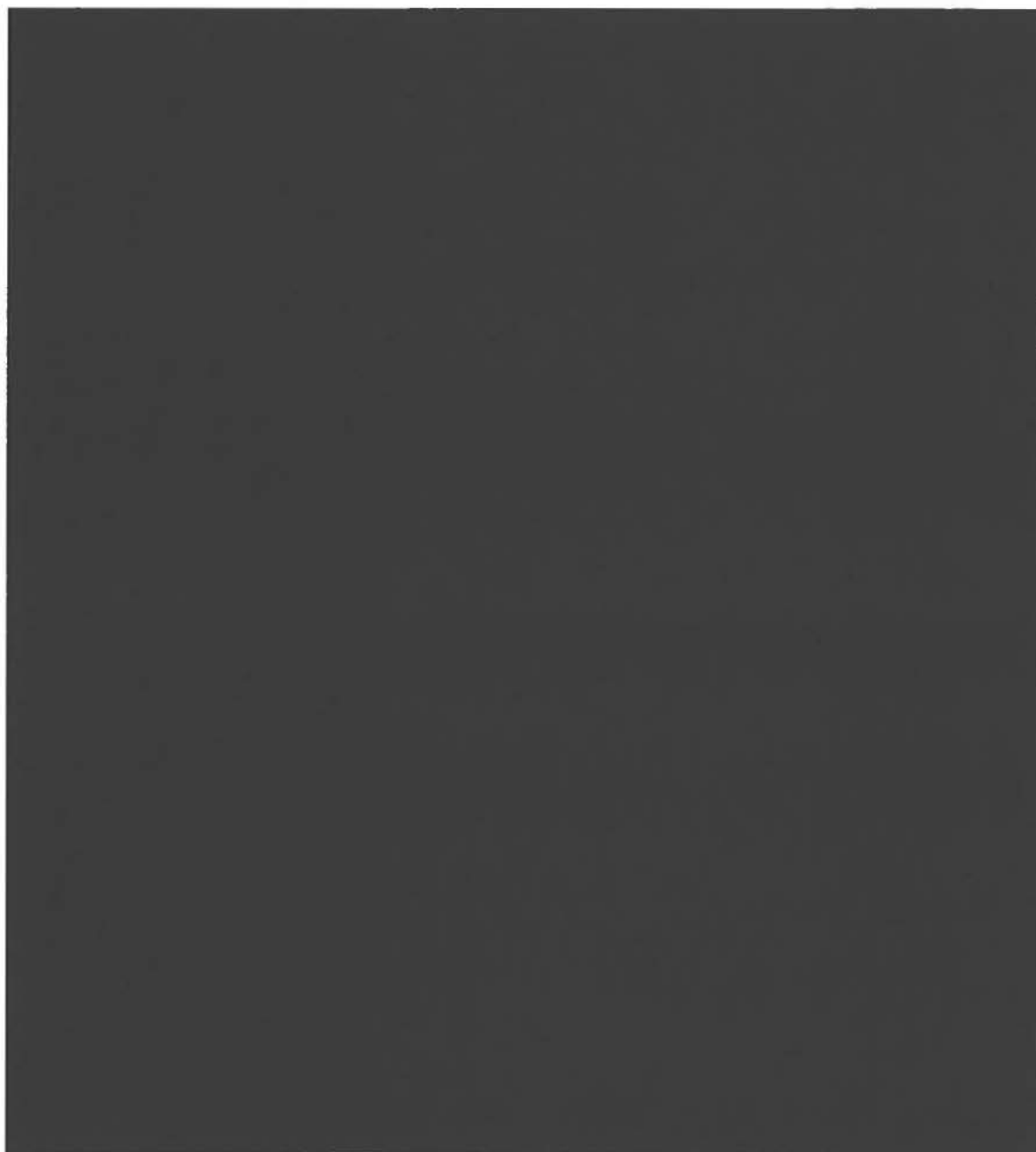


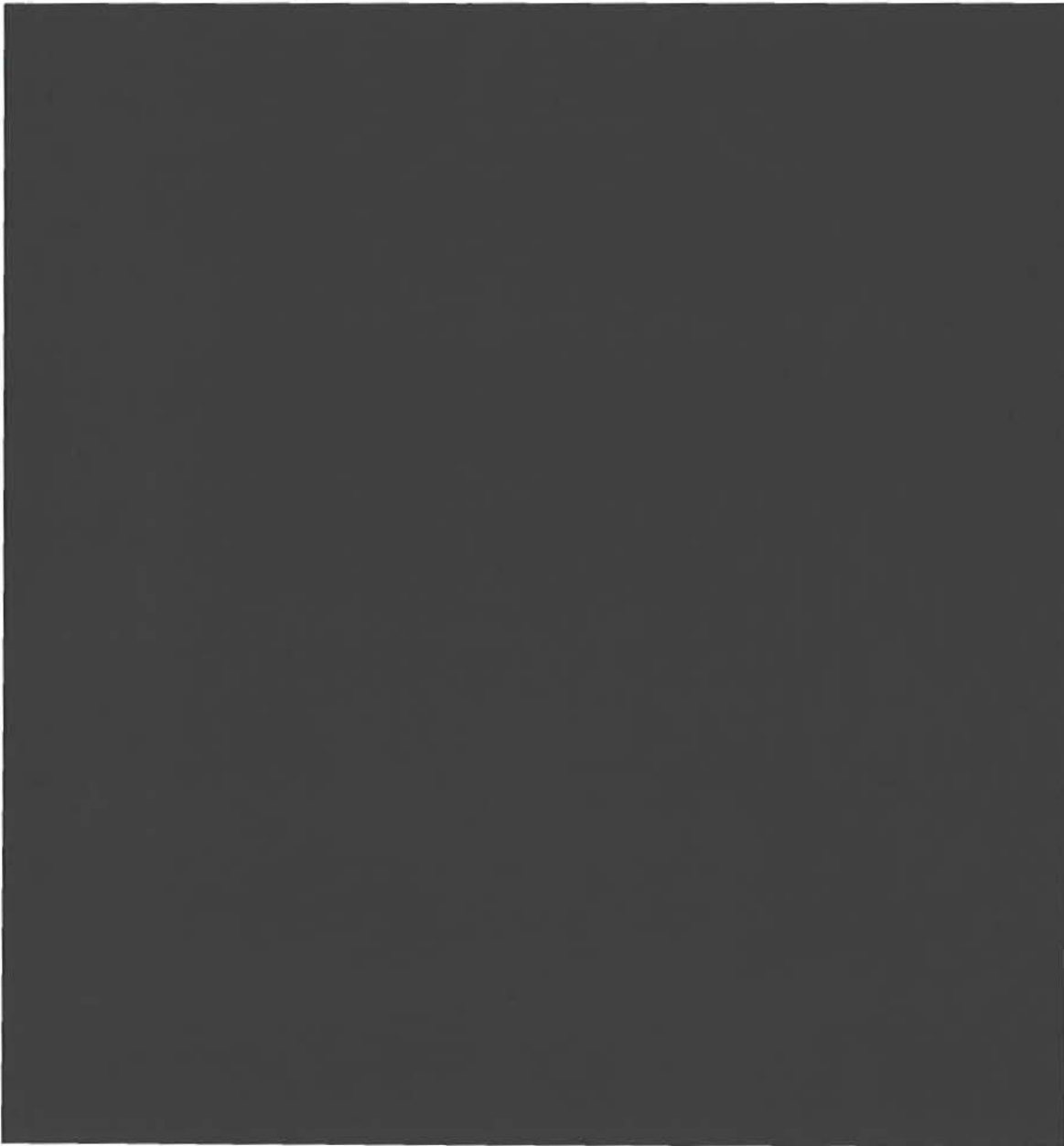






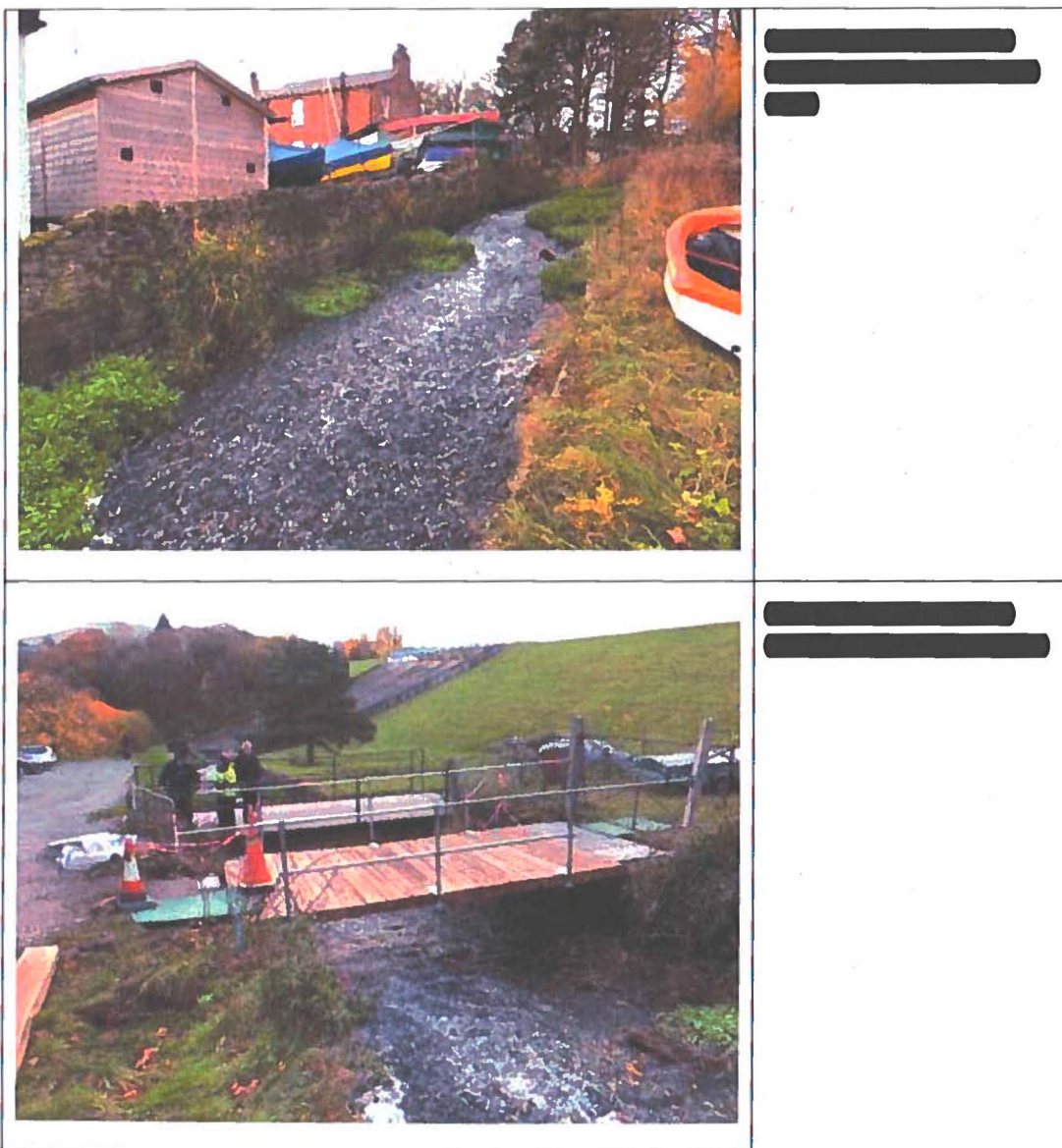






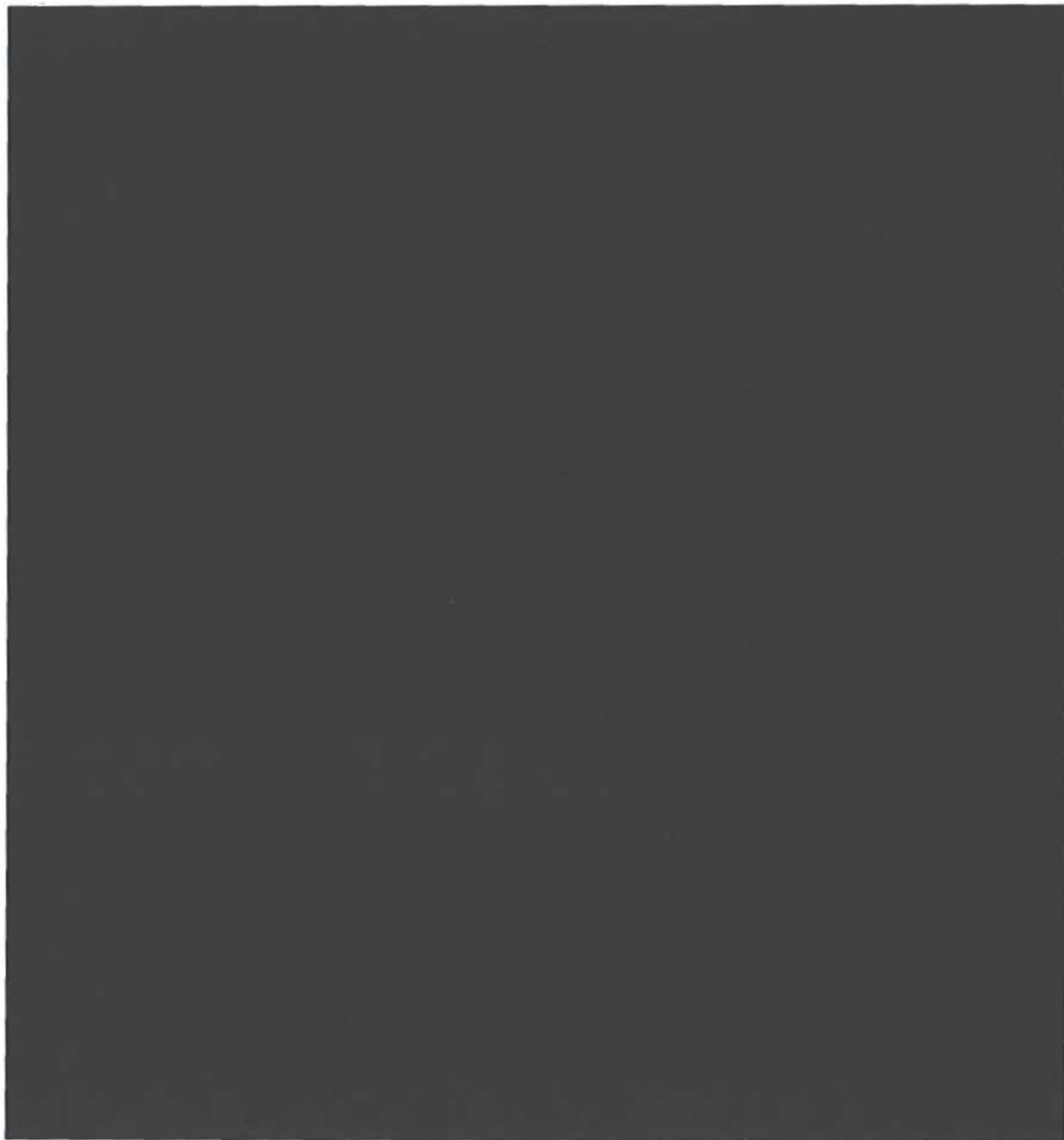






	<div data-bbox="938 309 1203 405" data-label="Text"><p>[REDACTED]</p></div>
	<div data-bbox="938 891 1230 987" data-label="Text"><p>[REDACTED]</p></div>



	<p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p>
	<p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p>



	<p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p>
	<p>[REDACTED]</p> <p>[REDACTED]</p>



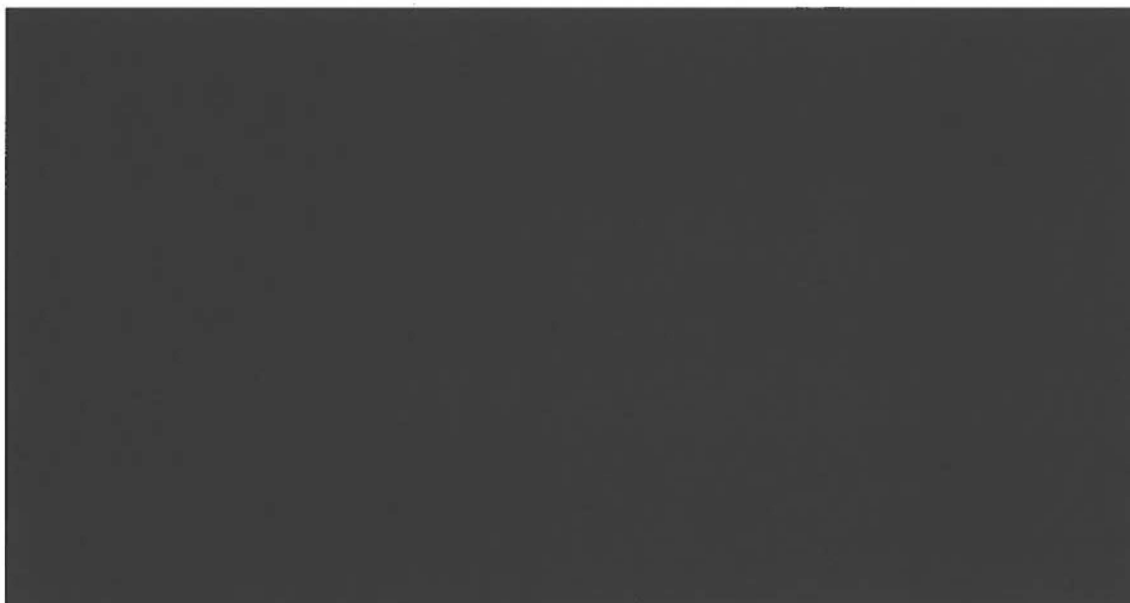
[REDACTED]
[REDACTED]
[REDACTED]

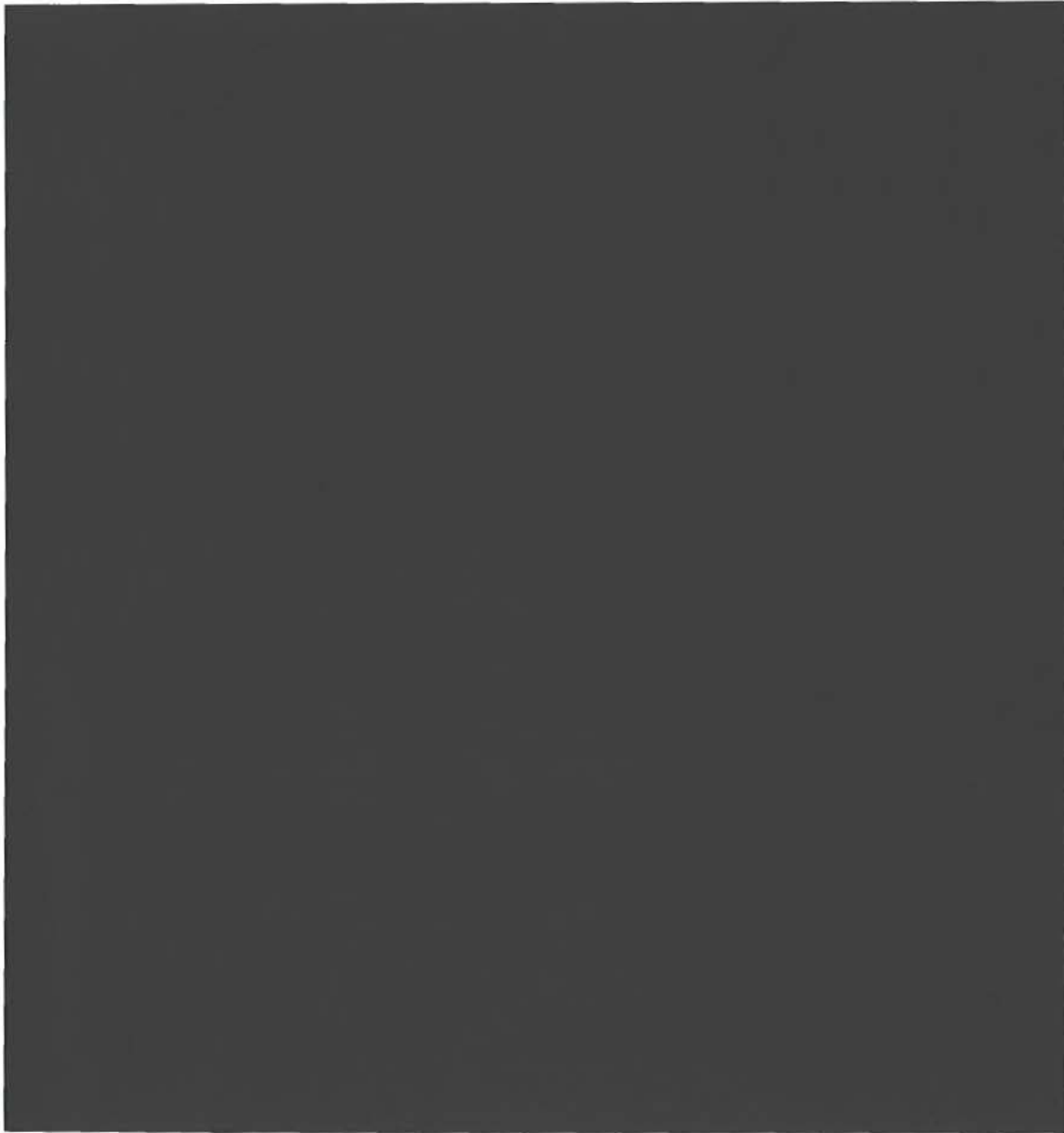


61 – Embankment toe

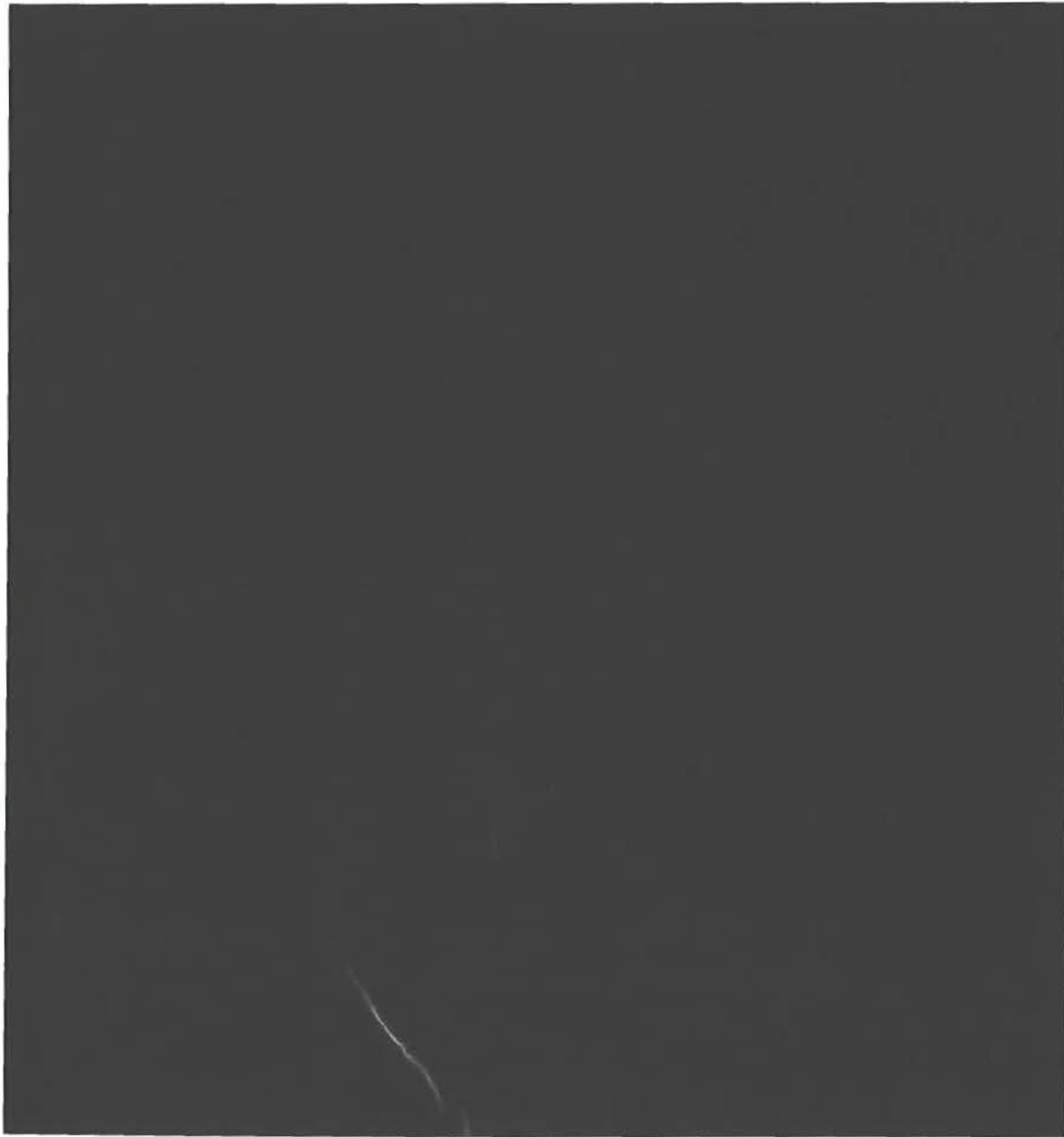
















[REDACTED]





[REDACTED]



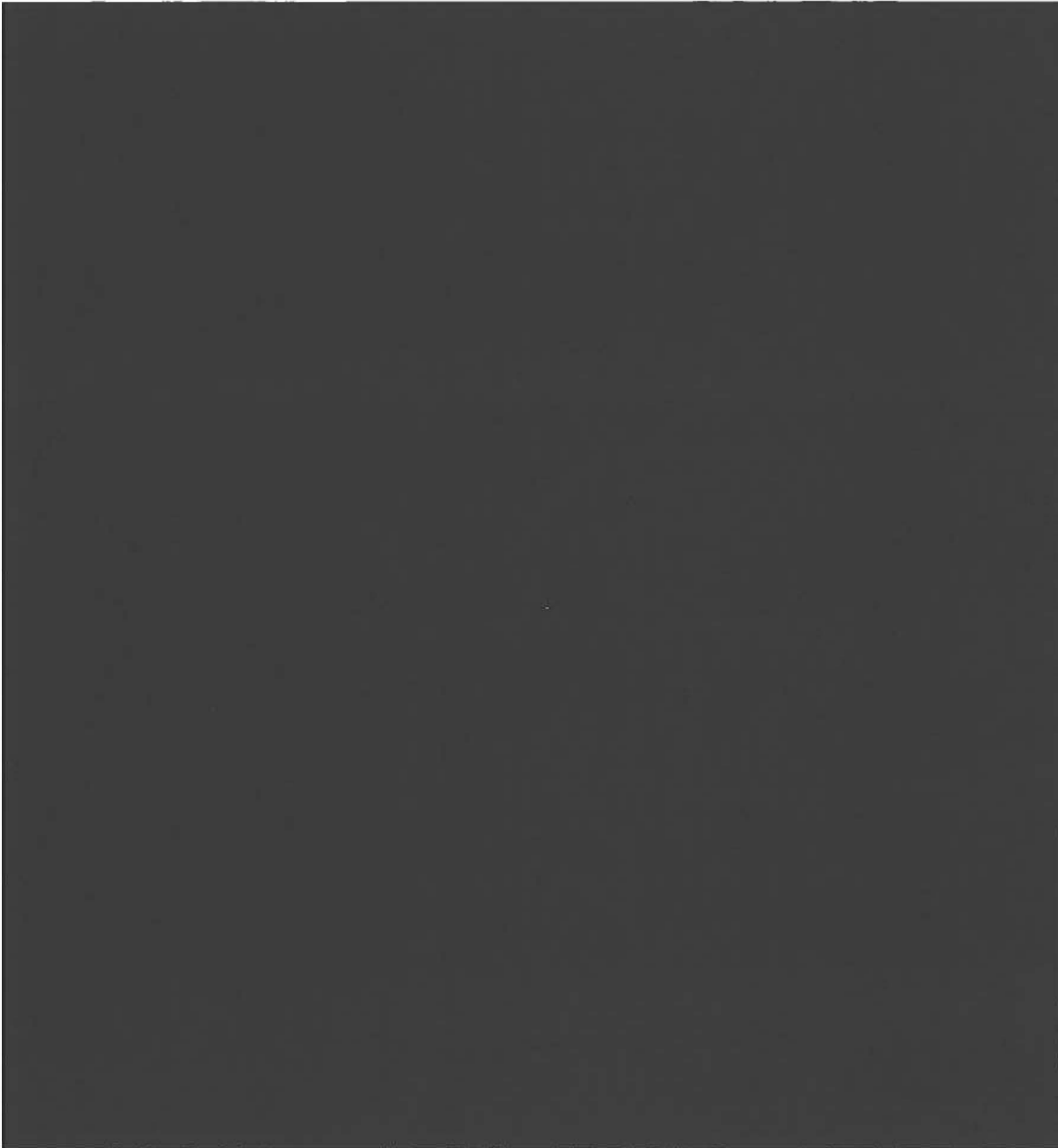


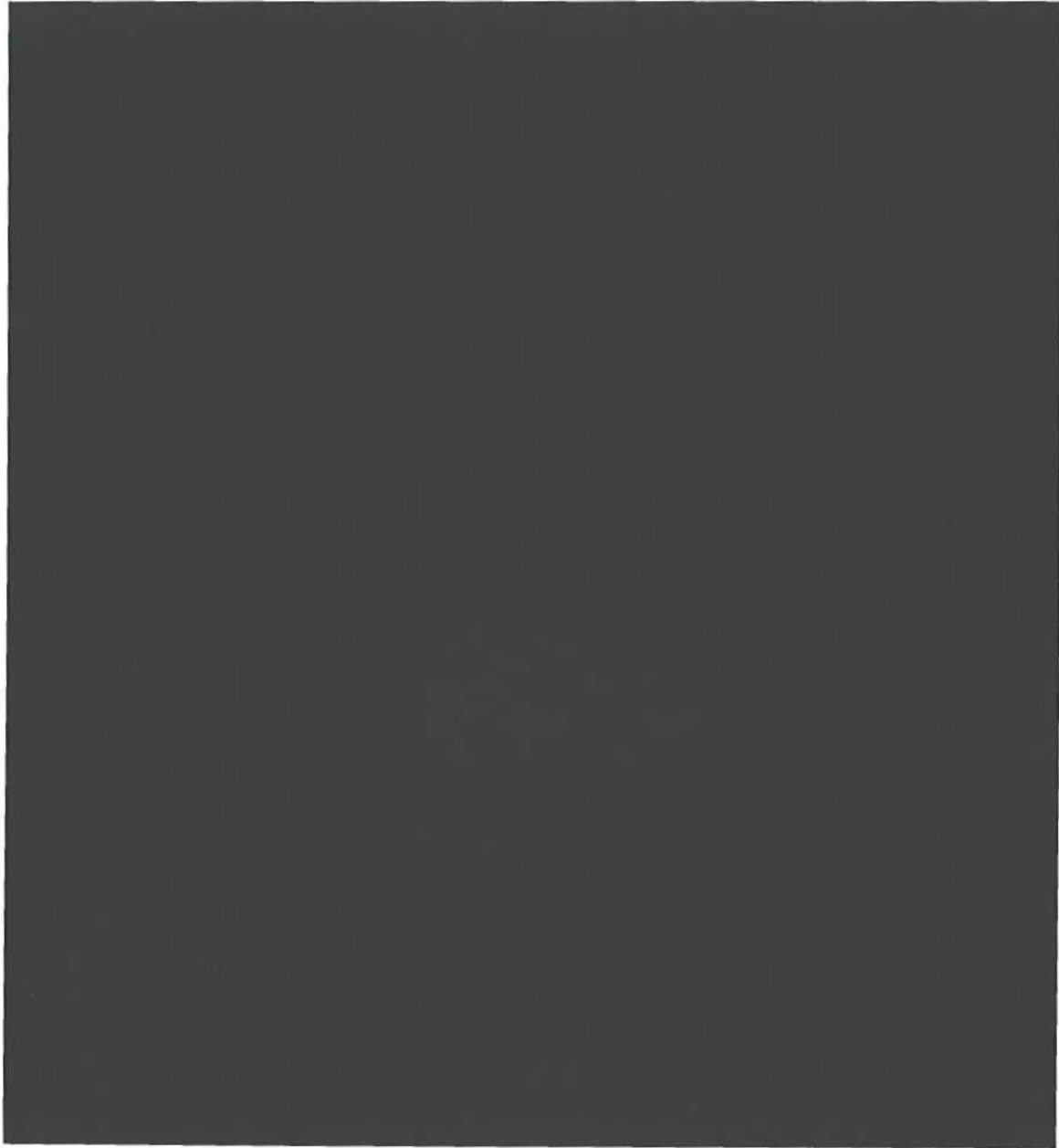


82 – River outfall V-notch

 A photograph showing a river flowing through a wooded area. The water is dark and reflects the surrounding trees. The banks are covered with fallen leaves in shades of orange, red, and brown. The trees are mostly bare, suggesting autumn or winter.	<p>83 – View downstream from river outfall V-notch</p>
 A photograph showing a view looking upstream from the center of a bridge. The bridge has a concrete parapet. In the background, there are brick buildings and trees. The water is visible in the distance.	<p>84 – View looking upstream from centre of Whalley Bridge</p>

B. CRT Record Photographs







C. Inspecting Engineer's Certificate issued under Section 10(5) of the Reservoirs Act

RESERVOIRS ACT 1975

INSPECTING ENGINEER'S CERTIFICATE UNDER SECTION 10(5)

I, Richard Jonathan Robson of Mott MacDonald, No1 Whitehall Riverside, LEEDS, LS1 4BN, being a member of the All Reservoirs Panel, appointed by the Canal & River Trust to carry out an inspection on the reservoir known as Toddbrook Reservoir, which is situated south-east of the town of Whalley Bridge in the High Peak area of Derbyshire and at National Grid Reference SK 007 810, made a report of that inspection on 29th March 2019, which includes measures to be taken in the interests of safety and also recommendations as to the maintenance of the reservoir under Section 10(3)b.

The report also includes a recommendation as to the time of the next inspection of the reservoir, which should be made on or before 13th November 2028.



Signature of Engineer:

Dated: 30th April 2019

