File ref 860/100/00 Upper Nene Structures

NRA

National Rivers Authority
Anglian Region

PROJECT No. 57049

UPPER NENE STRUCTURES

STANWICK

DETAILED APPRAISAL REPORT

MARCH 1992

Balfour Maunsell
Consulting Engineers
Sackville Place, 44 Magdalen Street, Norwich NR3 1JU

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PROJECT GROUP MEMBERSHIP

DETAILED APPRAISAL

This report was prepared in consultation with the following Project Group

PROJECT GROUP MEMBERS

	NAME	FUNCTION/DEPARTMENT	SIGNATURE
PROJECT MANAGER	R WEEDEN	Principal Engineer	.....
PROJECT ENGINEER	P COWIE/M HOWELL	Senior Engineer	.....
FINANCE REP	A BATCHELOR	Contract Accountant	.....
OPS REP	T YOUDAN	District Engineer	.....
OTHER REPS	P BARHAM	Conservation and Recreation Officer	.....

In addition to the members of the project group, assistance was given by and consultation took place with

NAME	FUNCTION/DEPARTMENT
J EAST	Assistant Hydrologist

CONTENTS

1.0 SUMMARY

1.1 Object

To maintain statutory navigation levels above the Irthlingborough lock which is located 1.5km north-east of Irthlingborough (refer location plan on page 3). To provide adequate control structures to cope with existing peak flows.

1.2 Problem

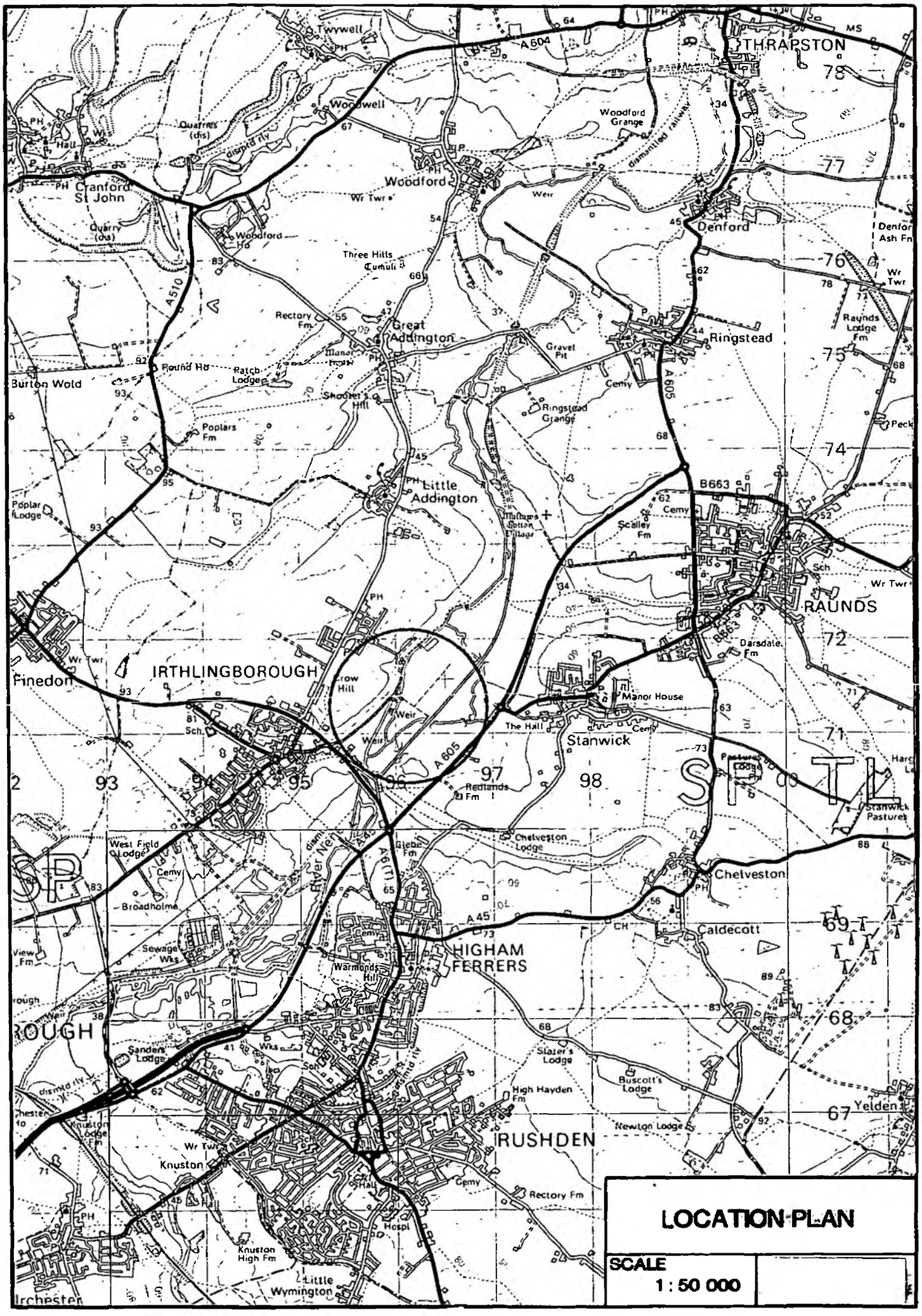
The weirs and sluices at Stanwick are in need of refurbishment or replacement.

1.3 Options

The following options have been considered:-

a) Do Nothing
b) Refurbish Existing Structures
c) Refurbish and Extend Existing Structures
d) Construct New Weirs at Sites 1 and 2
e) Construct New Weirs at Sites 1 and 2 and at sluices site

Alternative sites for the new weirs have been considered.


THRAPSTON
Twywell
A604
Woodwell
Woodford Grange
disused railway
Quarries (dis)
disused rly
Cranford St John
Woodford
Weir
Denford
Denford Ash Fm
Quarry (dis)
Woodford Ho
Three Hills Tumuli
A510
Rectory Fm
Great Addington
Gravel Pit
Ringstead
Raunds Lodge Fm
Burton Wold
Round Ho
Ratch Lodge
Shoulder's Hill
Cemy
A605
Ringstead Grange
Poplars Fm
Little Addington
Poplar Lodge
Scalley Fm
B663
RAUNDS
Darsdale Fm
Finedon
IRTHLINGBOROUGH
Crow Hill
Manor House
The Hall
Stanwick
Redlands Fm
Stanwick Pastures
West Field Lodge
Glebe Fm
Chelveston Lodge
Chelveston
Broadholme
A45
Caldecott
Sewage Wks
HIGHAM FERRERS
Warmonds Hill
Sanders Lodge
Slater's Lodge
Buscott's Lodge
High Hayden Fm
Yelden
Newton Lodge
Knuston Lodge Fm
RUSHDEN
Knuston
Rectory Fm
Hospl
Knuston High Fm
Little Wymington
Irchester
LOCATION PLAN
SCALE
1 : 50 000

2.0 DESCRIPTION OF PROBLEM

2.1 Statement of Need

2.1.1 The NRA has a statutory obligation to safeguard navigation on the River Nene. The water retention levels in each reach are maintained by locks and control structures for the purpose of navigation.

2.1.2 Locks provide the means of navigation between adjacent reaches, whilst the retention of river levels and the means to discharge flood flows should be provided by weirs and sluices.

2.1.3 At Stanwick, the maximum bankfull capacity is approximately 40 cumecs which is considerably less than the 1 year flood flows. "Reversing" the lock, to increase the bankfull capacity, is not practised at Stanwick because there is no downstream apron to the lock.

2.1.4 The weirs and sluices are in need of either refurbishment or replacement.

2.2 Statement of Fact

2.2.1 Stanwick sluices, weirs and lock (referred to as Irthlingborough lock) are located between Irthlingborough and Stanwick adjacent to the A605 and approximately 8km north east of Wellingborough. The National grid reference of the lock is NGR SP 960 714 - see Appendix A for location plan. The site represents one of the 38 river control sites on the navigable length of the River Nene between Northampton and Peterborough.

2.2.2 At this site the following structures maintain the navigation levels and allow the discharge of river and flood waters. Refer to layout plan in Appendix B and photographs in Appendix C.

a) Lock, comprising mitre gates upstream and guillotine gate downstream.
b) Weir No.1 10m wide and situated on the main river arm 250m from the navigation arm split.

c) Weir No.2 18m wide and situated 150m upstream of the lock.
d) A 3.7m wide vertical gate sluice and a 2.7m wide tilting gate sluice at the site of the old mill.

2.2.3 The lock and weirs were constructed in the 1930's and the two sluice gates were installed in the old mill channels in the early 1960's.

A report on the structural condition of the structures is provided in Appendix D and a report on the mechanical condition in Appendix E.

2.2.4 The following is a brief summary of the condition of the structures:-

a) Lock - generally satisfactory condition but with significant leakage from vertical wall cracks.
b) Weir No. 1 - concrete construction with brick sidewalls - generally good condition.
c) Weir No. 2 - concrete construction with gabion sidewalls - some repair necessary.
d) Sluices at old mill site - satisfactory condition.

2.2.5 Unlike many of the old mill sluices on the River Nene, the sluices at Stanwick are wholly owned by the NRA who are fully responsible for their condition and operation.

2.2.6 The theoretical combined bankfull capacity of the control structures at this site is 39.7 cumecs. This capacity is based on a bankfull level of 35.70m at the upper junction of the navigation and main river arms and is made up as below:-

a) Weir No. 1		8.3 cumecs
b) Weir No. 2		6.8 cumecs
c) Sluices at mill site	i) vertical gate	15.3 cumecs
	ii) tilting gate	6.9 cumecs
d) Lock, over closed mitre gates		2.4 cumces
	TOTAL	39.7 cumecs

This bankfull capacity is substantially less than the one year return flood flow of 60.3 cumecs.

2.2.7 The major part of the River Nene valley in this locality is owned by ARC and has been or will be used by them for river gravel extraction. Areas to the north east of the lock and sluices have already been worked - refer to Appendix B. ARC intend to extract gravel from the land between the navigation and main river channels in approximately 2 years time, say 1993 to 1994.

ARC have an agreement, made with Anglian Water Authority prior to the setting up of NRA, which allows mineral extraction in ARC's land subject to safety and continuity of flow conditions.

ARC have produced a restoration plan for the area (refer Appendix F) which includes the restoration of all overflow channels. It is anticipated that restoration will be complete before any work is commenced on these river control structures by the NRA.

2.3 Forecasts and Design Criteria

2.3.1 There are no specific significant proposed developments which will affect the water flows at the Stanwick site. River Nene growth curve factors have been adopted to compute the design flood flows.

2.3.2 Design Flows

The theoretical design flows on the River Nene at Stanwick have been provided by the assistant hydrologist of NRA, Anglian Region, and are as follows:-

Return Period years	Flow cumecs
1	60
5	81
10	98
20	113
50	143
100	215

2.3.3 Design Criteria

The following criteria have been adopted:-

a) The replaced and refurbished control structures should require minimal attention from operational staff.
b) The design bankfull discharge capacities for the whole of the site shall be for two alternative criteria:-
   i) 1 year return period flood (i.e. 60 cumecs)
   ii) 5 year return period flood (i.e. 81 cumecs)
c) To increase the bankfull capacity it is assumed that the drought retention level can be reduced by 150mm from existing levels. There will still be adequate water depths for navigation (approx. 1.68m at the lock sill).

2.3.4 Environmental Considerations

2.3.4.1 The river valley in this vicinity has been, and will continue to be, drastically reshaped with gravel extraction activities.

2.3.4.2 Traditionally large open areas of water have been left following gravel working with very little landscaping effort.

2.3.4.3 The current extraction license requires that the completed workings be restored to an agreed plan, part of which is reproduced as Appendix F.

2.3.4.4 It is anticipated that extraction in the vicinity of the two weirs will have been completed by the time that the proposed works are commenced.

2.3.4.5 There is no designated footpath along the river banks at this site. Access over the various channels is afforded by footbridges for pedestrians and bridges and a ford for vehicular traffic.

2.3.4.6 The river level in the reach between Higham and Stanwick is currently very high and it is believed that a reduction of 150mm in level will not cause any particular long lasting detrimental environmental effects.

There is an SSSI adjacent to the river on this reach to the south of the A6 Irthlingborough Road bridge which will be affected by the reduction in water level. The reduction in water level will mean less flooding of adjacent meadows and a generally drier regime.

2.3.4.7 The following environmental organisations have been contacted:-

English Nature
Countryside Commission
Northamptonshire Naturalist Trust

General details of proposals were given to the above organisations and their comments requested.

3.0 FORMULATION OF OPTIONS AND PROPOSED SOLUTIONS

3.1 Key Objectives

The key objectives are:-

a) Maintain statutory navigation level.
b) Recommend improvements to the control structures to increase the bankfull capacity to a 1 in 1 year discharge capacity.
c) Investigate structures that would be required for a 1 in 5 year discharge capacity.

3.2 Options Considered and Evaluated

3.2.1 Option 1 - Do Nothing

This option does not satisfy any of the key objectives. The structures are ageing and refurbishment of the structures is required as a minimum measure to maintain safe and reliable statutory navigation rights on the River Nene. This option is therefore not considered further.

3.2.2 Option 2 - Refurbish Existing Structures

3.2.2.1 This option would satisfy the first key objective of maintaining statutory navigation levels. However, the bankfull capacity will remain well below the 1 year flood capacity and therefore the second key objective is not satisfied.

3.2.2.2 Weir No. 1 is in reasonable condition and refurbishment would entail some brickwork and concrete repair and some downstream bank protection and scour hole filling.

3.2.2.3 Weir No. 2 is of more recent construction but requires concrete joint renewal, scour hole repair and extended bank protection.

3.2.2.4 The two sluices are in reasonable condition but the adjacent masonry and concrete requires attention. To automate the sluices such that they will operate to maintain a predetermined upstream water level, a power supply, motor drives and logical control system is required. A telemetry connection will also be included to provide remote information about the local status.

3.2.2.5 The estimated costs of refurbishing the structures and automating the sluices is £101,000 with capitalized operating costs of £17,500 (refer Appendix H1 for detailed breakdown).

3.2.3 Option 3 - Refurbish and Extend Control Structures

3.2.3.1 Of the three control structures it is most economic to extend Weir No. 1. Weir No. 1 has a lower crest level than Weir No. 2 and is in a location such that an enlargement of the river channel is not required.

3.2.3.2 To provide for 1 year flood capacity Weir No. 1 must be extended by 37m to 47m. It could be argued that an extension of 370% constitutes such a major change that a totally new weir would be the logical option.

3.2.3.3 The estimated cost of extending Weir No. 1, refurbishing all existing structures and automating the sluices is £304,000 with capitalized operating costs of £17,500 (refer Appendix H2 for detailed breakdown).

3.2.3.4 To accommodate a 5 year flood the length of Weir No. 1 would require to be extended to 75m and the river channel enlarged between the river split point and Weir No. 1. The estimated capital cost of this scheme is £425,000 with capitalized operating costs of £17,500.

3.2.3.5 The river channel between Higham and Stanwick has insufficient capacity to pass a five year flood and enlargement of this channel has been allowed for as an additional cost for all '5 year' schemes.

3.2.4 Option 4 - Construct New Weirs

3.2.4.1 All proposals for new structures have assumed a reduction in normal water level of 150mm. This allows for greater head and therefore greater discharges over weirs although the lower water level slightly reduces the maximum capacity of the existing sluices.

3.2.4.2 Several alternative locations for new weirs have been investigated as well as constructing a fixed weir to replace the sluices. The optimum locations, from hydraulic, environmental, navigation, planning and economic considerations, appear to be very similar to the three existing locations.

3.2.4.3 It is recommended that the increased flows be taken by a larger weir at Weir No. 1 location. This will cause least danger for navigation and require none or least enlargement of river channels. The overflow channel, which will require complete replacement as part of ARC's restoration, could be sized accordingly at the time of restoration.

3.2.4.4 Two alternative proposals are considered below and are denoted as 4A and 4B. Alternative 4A consists of new reduced level weirs at the locations of Weir No. 1 and Weir No. 2 along with refurbishment and automation of the existing sluices.

Alternative 4B consists of new weirs at locations of Weir No. 1, Weir No. 2 and the sluices.

3.2.4.5 Option 4A

To cater for 1 year flood flows the weir details will be as follows:-

	max. flows cumecs
Weir No. 1, crest level 34.880, crest length 21m	23.0
Weir No. 2, crest level 35.000, crest length 18m	14.7
Refurbished and automated sluices	21.0
Lock, over closed mitre gates	1.6
TOTAL	60.3 cumecs

The total estimated capital cost of this scheme is £275,000 with capitalized operating costs of £17,500 (refer Appendix H3 for detailed breakdown).

To allow for a 5 year flood the length of Weir No. 1 must be increased to 40m and the river channel enlarged between the river split point and Weir No. 1. The estimated capital cost of this scheme is £380,000 with capitalized operating costs £17,500.

3.2.4.6 Option 4B

This alternative which replaces the sluices by a fixed weir has the advantage of no mechanical or electrical installations with the consequent saving of operation and maintenance costs.

The old mill site where the sluices are situated could be completely remodelled to include a curved or V-shaped weir and a new lightweight bridge for the proposed bridleway. The existing sluice channels and one of the existing bridges are very old and will require periodic maintenance to keep them in satisfactory condition.

To cater for 1 year flood flows the weir details will be as follows:-

	max. flows cumecs
Weir No. 1, crest level 34.950, crest length 23m	24.1
Weir No. 2, crest level 35.000, crest length 18m	14.7
New weir at old mill site, crest level 34.880, crest length 22m	19.8
Lock, over closed mitre gates	1.6
TOTAL	60.4 cumecs

The total estimated cost of this scheme is £378,000 (refer Appendix H4 for detailed breakdown).

To allow for a 5 year flood the length of Weir No. 1 must be increased to 50m and the river channel enlarged between the river split point and Weir No. 1. The estimated cost of this scheme is £537,000.

3.3 Selection of Option

3.3.1 The summary table in Appendix H5 sets out the estimated costs of the various options.

3.3.2 Of the three options that meet the key objectives, i.e. 3, 4A and 4B the most cost effective option is option 4A (refurbish and automate sluices and construct new weirs at similar locations to Weirs No's 1 and 2).

The total capital cost of this option for 1 year capacity is estimated to be £275,000.

If 5 year capacity is required then Weir No. 1 must be increased in length and the total estimated cost is £380,000.

3.3.3 The estimated costs of Option 3 (refurbish structures and extend Weir No. 1) are only slightly greater than the cheapest Option 4A. However, the required length of Weir No. 1, 47m, would produce a very prominent structure and extending an existing structure could result in technical difficulties. Also, the fact that Option 4A includes for completely new weir structures whereas Option 3 includes for refurbished structures makes 4A more favourable.

3.3.4 Option 4B with a weir replacing the sluices is the only option without a mechanical and electrical installation. The advantages of this cannot be justified by the additional capital cost of £103,000.

3.3.5 Option 4A appears to best satisfy all the design criteria and key objectives and is the cheapest option. It therefore is recommended as the preferred option.

3.4 Project Timing

3.4.1 A possible programme for the reconstruction works at Stanwick is:-

Detailed Appraisal complete	March 1992
Detailed Design	1995/96
Construction	1996/97

3.4.2 Expenditure Profile (in £000) for the above programme would be:-

	91/92	92/93	93/94	94/95	95/96	96/97	Total
Works	-	-	-	-	-	219	219
Fees	6	-	-	-	18	10	34
Salaries	2	-	-	-	3	2	7
							260

National Rivers Authority
Anglian Region

Meeting: WELLAND AND NENE LOCAL FLOOD DEFENCE COMMITTEE

Date: 13 MARCH 1992

Item No. 13	**Report No.** 09/92
Subject: UPPER NENE CONTROL STRUCTURES - DESIGN STANDARDS	

SUMMARY

This report recommends that design standards for control structures on the Upper Nene are set to maintain the status quo in terms of return periods. It also recommends that where such structures are replaced the opportunity should be taken to eliminate the need for lock reversal.

REPORT

With the exception of those structures at Perio, Upper Ringstead and Lower Wellingborough which have been designed to a "5 year return period" standard the bankfull capacity of the remaining control structures on the Upper Nene is to "1 year return period" or less. The NRA proposes not to increase this standard for the following reasons:-

(a) the raising of standards and improvements to structures will only yield marginal benefits - much of the existing flood plain is either pasture or gravel workings.

(b) landowners are being encouraged to apply for "Countryside Stewardship" which will involve them maintaining the present landscape.

(c) the NRA has a duty under Section 16 of the Water Resources Act 1991 to conserve and enhance the natural beauty of physical geographical features - such as flood plains.

(d) Until a comprehensive computer model of flows in the Nene is available the effects of increasing the existing standard is uncertain - it could conceivably lead to an increased flooding risk in Peterborough.

Further, it is suggested that in order that the NRA minimise future maintenance costs, and to make structures safer and more manageable during periods of high flows - those structures where lock reversal is currently necessary should be redesigned such that the by-pass weir capacity is increased to facilitate the discharge of flood flows, thereby making the operation of lock reversal unnecessary during flood events. The structures which come into this category are:- Hardwater, Ditchford, Titchmarsh, Wadenhoe, Warmington, Elton, Cottestock and Yarwell.

The NRA intends to apply to MAFF for grant aid towards these schemes.

RECOMMENDATION

The Committee is asked to approve the approach recommended in this respect.

Bryan Utteridge
Operations Manager (Northern)

IRTHLINGBOROUGH LOCK

LIMIT OF ARC'S WORKING TO JAN 1992.

PROPOSED LAKE AS ARC'S RESTORATION PLAN

EXISTING WEIR No 2
good card.

EXISTING BRIDLEWAY.

NAVIGATION. CHANNEL.

PROPOSED BRIDLEWAY AS ARC'S RESTORATION PLAN.

EXISTING ACCESS ROAD

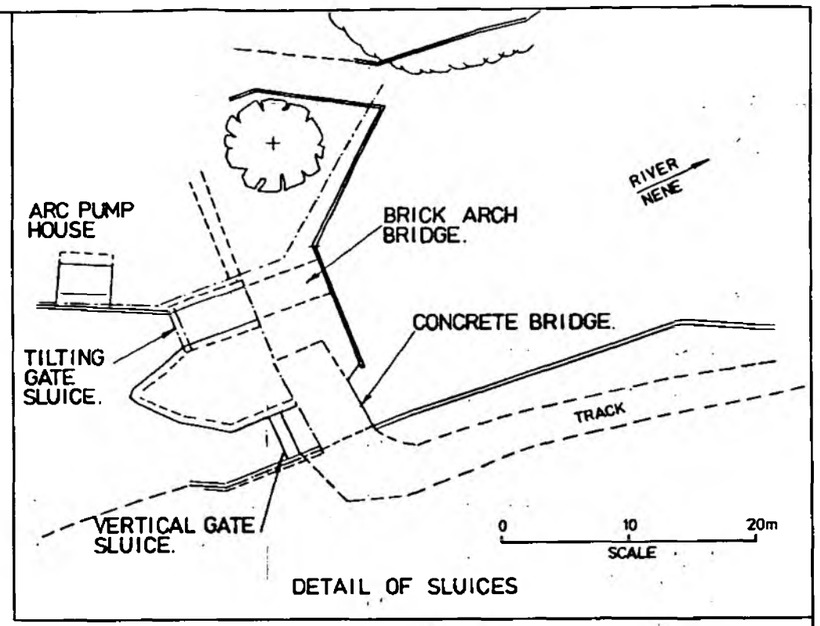
STANWICK SLUICES.
(SEE ENLARGED DETAIL ABOVE.)

PROPOSED BRIDLEWAY DIVERSION AS ARC'S RESTORATION PLAN

EXISTING WEIR No1
+ not v. g. card.

FROM HIGHAM

0 100 200m
SCALE



DETAIL OF SLUICES

National Rivers Authority
Anglian Region

NRA

UPPER NENE STRUCTURES — STANWICK

LAYOUT PLAN

Balfour Maunsell
CONSULTING ENGINEERS

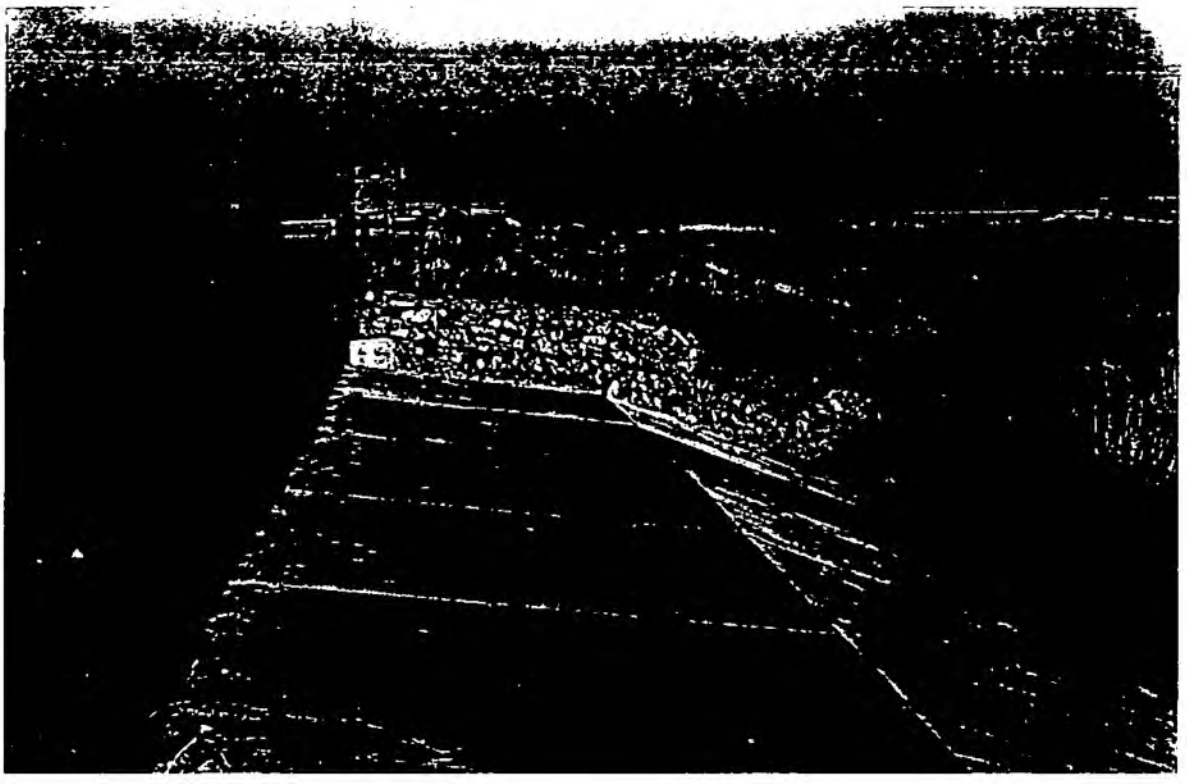
DATE: FEB 1992 DRAWN BY: A.T.

SCALE: SEE BAR SCALES.

APPENDIX B

Weir No. 1

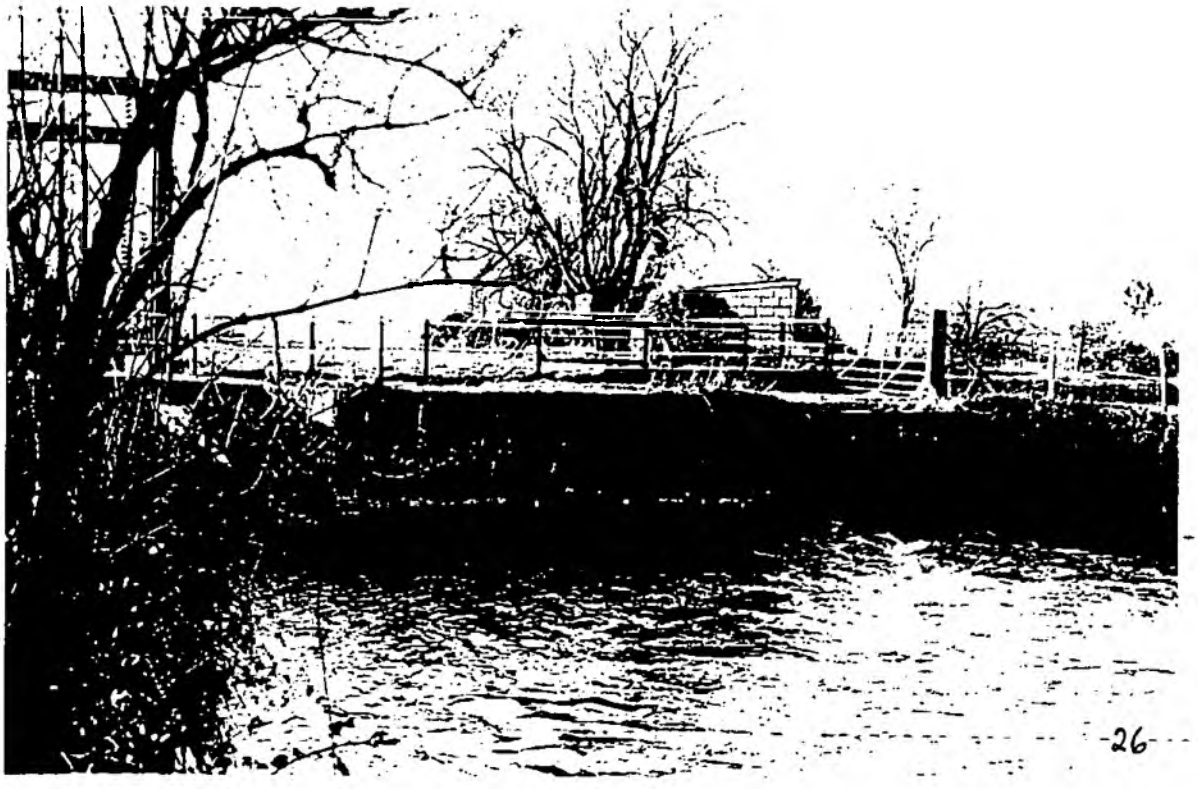
Weir No. 1 - high river flows on 20.11.91



Weir No. 2

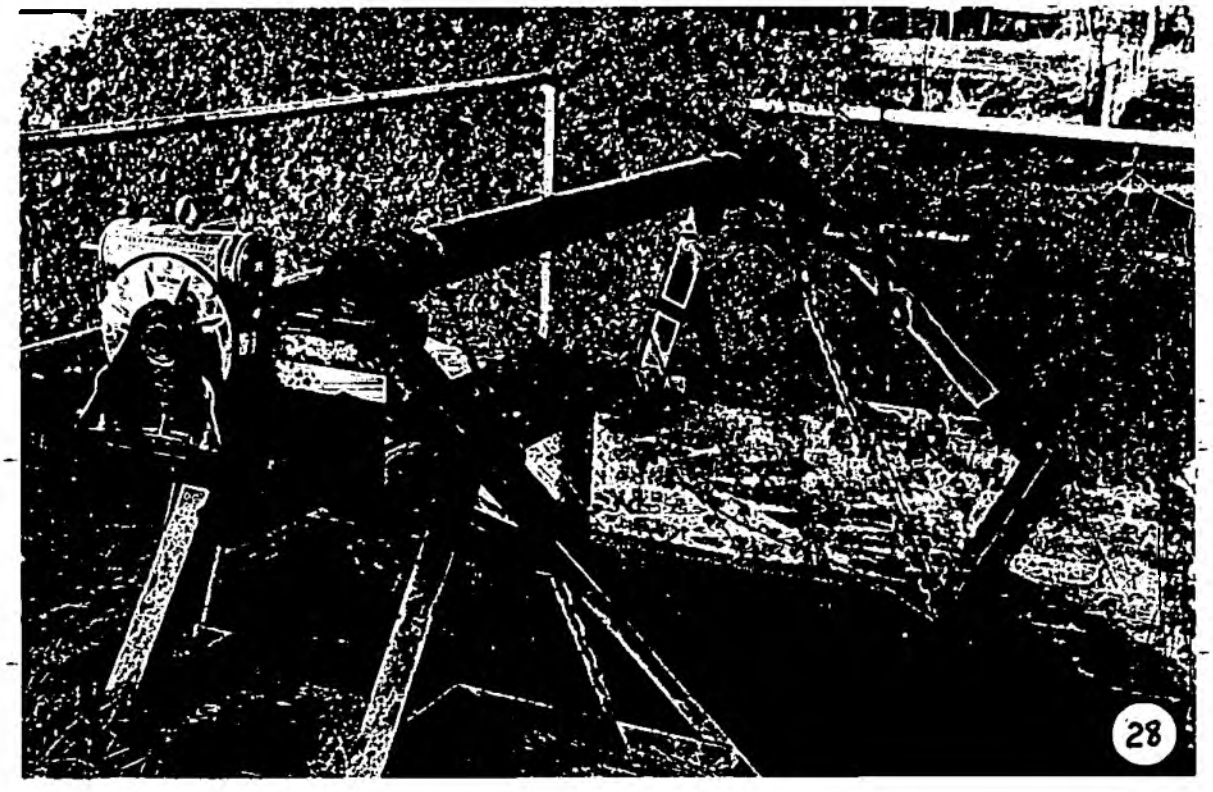
Weir No. 2 - high river flows on 20.11.91

Stanwick Sluices - viewed from upstream

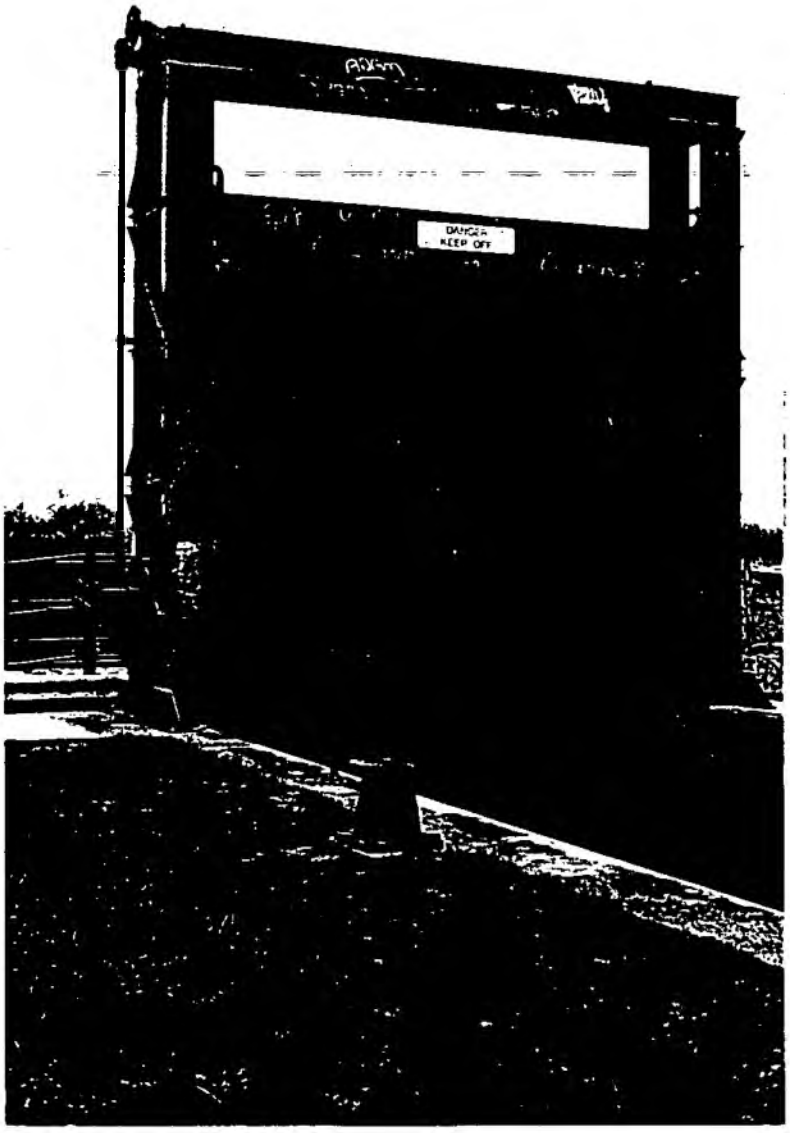


Stanwick Sluices - viewed from downstream

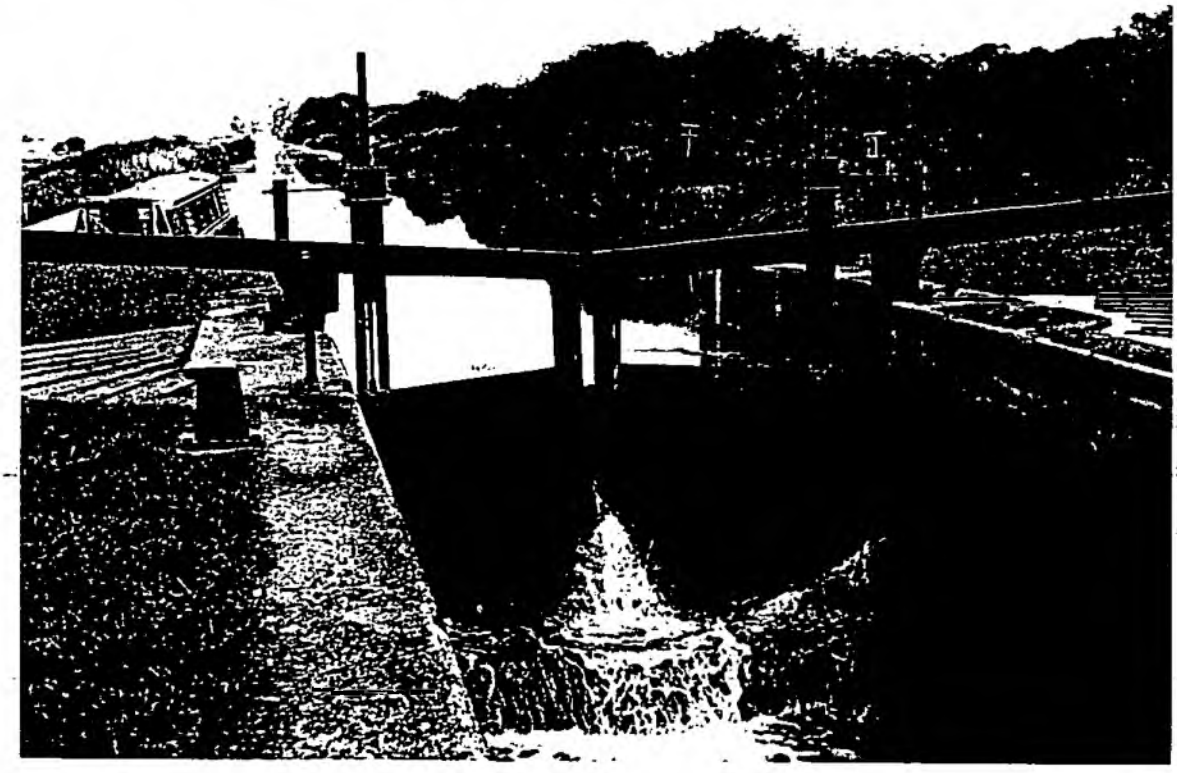
Stanwick Vertical Gate Sluice



Stanwick Tilting Gate Sluice



Irthlingborough Lock
- guillotine gate raised



Irthlingborough Lock - note leak through mitre gates
- upstream water level lowered for inspection

SURVEY REPORT - STRUCTURAL CONDITION

R Huggard visited the Stanwick site on Wednesday 7 August 1991. Also in the survey team were N Smith, J Ward and D Nunn of Balfour Maunsell. They were accompanied by G Davies and M Shilling of the National Rivers Authority.

1. Site Conditions

1.1 There was no flow over the Weir No. 1 and the Weir No. 2, but there was flow over or through all the other structures.

1.2 No underwater inspection took place and only a slight drawdown of the water level had been possible. Hence the condition of the underwater parts of the structures and any scour problems cannot be commented on.

2. Stanwick Sluices

2.1 Areas of the vertical sluice walls were in poor condition as the facing concrete had fallen off, and this had allowed deterioration of the brickwork to occur. Also there were vertical cracks in the concrete which will allow the entry of water and possible further deterioration.

2.2 Whilst the damage noted above is repairable there will be an ongoing maintenance cost as other parts weaken. This is borne out by the presence of past repair work.

2.3 The concreting in of three inlet pipes adjacent to the concrete bridge had been roughly done, though serviceable. This area may well lead to future maintenance problems.

2.4 The parts of the concrete bridge which were visible were in good condition but its load carrying capacity will need to be assessed.

2.5 The parts of the brick arch which were visible were in poor condition, and since there is fast turbulent flow under the arch it is expected that the soffit and walls will also be in poor condition. It is recommended that if the arch is to be retained then the flow should be stopped off, the arch thoroughly inspected and its load capacity assessed.

2.6 The righthand downstream springing of the arch and the wall adjacent to it contained loose and broken stones. These should be replaced and repointed in the immediate future.

2.7 The downstream sheet pile and brickwork river retaining walls were in good condition.

2.8 The access to the tilting sluice was by a wooden plank bridge, which is inadequate for safe working practice.

3. Weir No. 1

3.1 This weir, which allows overflow from the main river channel, appeared in good condition. The upstream face was underwater and so no comments can be made about it. The top surface, whilst weed covered, appeared in good condition. The downstream sheet piles appeared in good condition.

3.2 The south west side brick retaining wall was in good condition. However the north east side brick retaining wall was cracked and the coping had moved. The damaged parts of the wall need replacing before the situation becomes worse.

4. Weir No. 2

4.1 This weir, which allows overflow from the navigation channel, was generally in good condition but was in need of routine maintenance work.

4.2 The concrete surface was in good condition but the sealant between the panels was brittle. This should be raked out and replaced, before it breaks down and allows water to get into the structure of the weir.

4.3 The upstream sheet piles were in good condition. The downstream end of the weir had been eroded and there was a danger of the weir being under mined. Thus the downstream channel bed should be repaired in the immediate future.

4.4 The north east gabion wall had partially collapsed. Whilst this does not present an immediate problem it should be repaired before a high water flow causes erosion of the adjacent bank.

5. Irthlingborough Lock

5.1 The concrete structure of this lock was generally in good condition. However there were vertical cracks in the walls which allowed water to drain behind the wall when the lock was filled. This then either drained back into the lock as its water level was lowered or out through cracks in the concrete adjacent to the downstream gates. Whilst this process did not appear to cause a problem, it may well be leading to erosion behind the wall and so the cracks should be sealed.

SURVEY REPORT - MECHANICAL EQUIPMENT CONDITION

D Nunn visited Stanwick on Wednesday 7 August 1991. Also in the survey team were Messrs Smith, Huggard and Ward of Balfour Maunsell. We were accompanied by Messrs Davis and Shilling of NRA.

1. Stanwick Sluices

1.1 Two parallel channels one containing a vertical lift gate the other a tilting gate both manually operated (refer photographs in Appendix C3 and C4).

1.2 The vertical lift gate is operated by two chains passing over high level sprockets to a counter balance. The horizontal sprocket shaft is driven by bevel gears from a vertical drive shaft coupled to a gear box. The input to the gear box is by a guarded square shaft with provision for a hand crank.

Gearbox Bonfiglioti Italy
BF86/156
3.00 30
86120064

General condition good apart from leaking side seals (unable to check the flexible coating on the seal tube).

Safety - Satisfactory
Drawing available - manufacturer A H Allen & Co (Spencer Bridge, Northampton).
Drawing No. (NRA 32/9/623/0143)

1.3 The tilting gate is overshot. It is lifted by two chains shackled onto wire ropes passing round a winding drum. The winding drum is supported in roller bearings mounted on 'A' frames each side of the channel. The winding drum is coupled to the output shaft of a worm gearbox the input shaft of which is round with a keyway.

Gearbox Bonfiglioti Bolognio
VF 130/A
No 01/90
HP 320 i80
12500169

General condition - No evidence of seal failure. In need of painting. Mechanical condition appears good.

Safety - Unsafe access bridge and no barrier between operating position and bank.

1.4 Electricity Supply

If required a supply may be available via ARC's adjacent abstraction pumping station.

2. Irthlingborough Lock

2.1 A navigation lock comprising at the downstream end a vertical lift gate and upstream mitre gates (refer Appendix C5 for photographs).

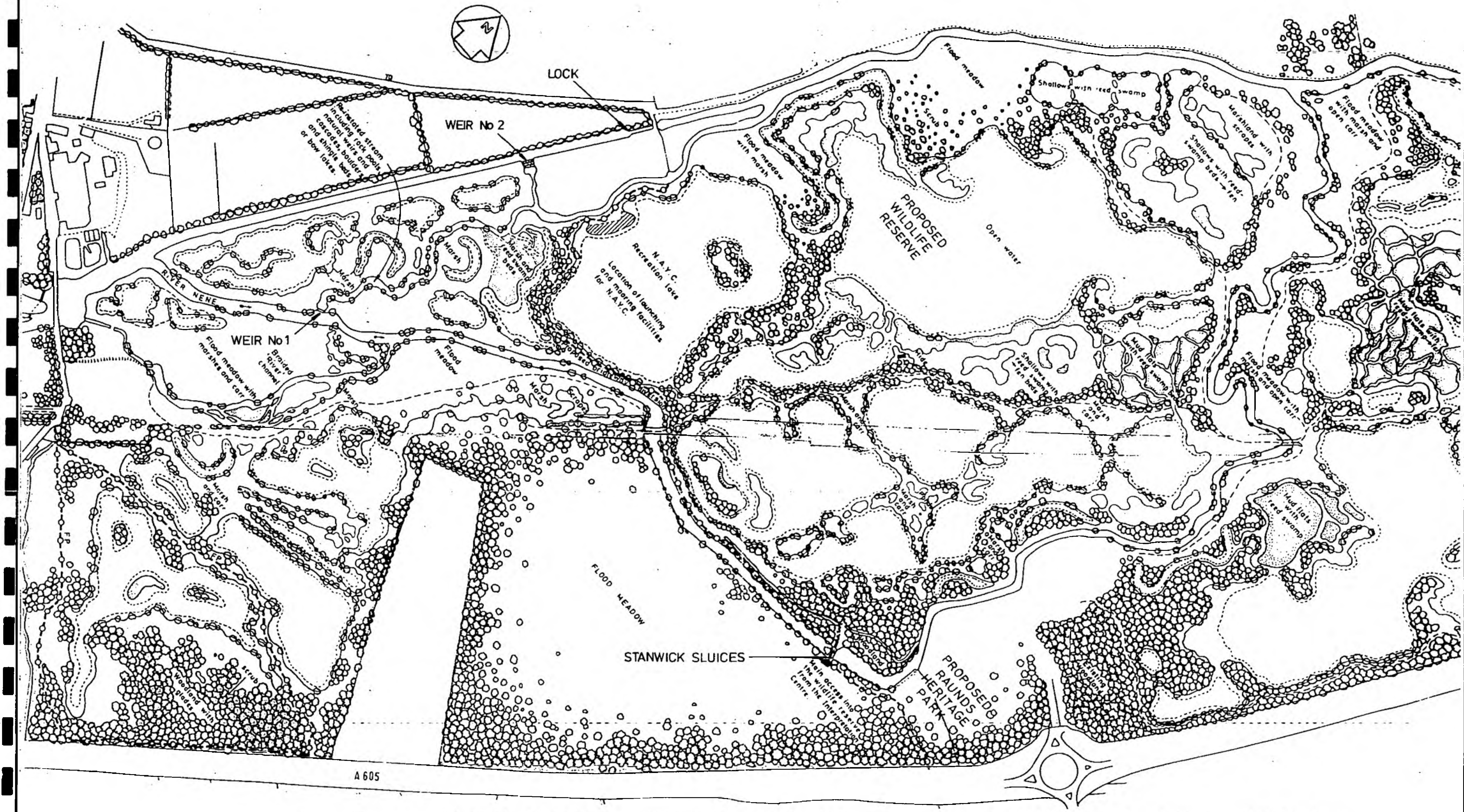
2.2 The vertical lift gate is of Glenfield manufacture and is operated by two chains passing over high level sprockets to a counter balance. The chain sprockets are connected through gears to a horizontal shaft. The horizontal shaft is driven by bevel gears from a vertical drive shaft coupled to a gear box. Manual operation is by a permanently fitted hand crank locked by an 'Abloy' key operated shoot bolt.

Gearbox Glenfield

General Condition - Good except side seal tubes have lost their flexible coating.

Safety - Satisfactory

2.3 The steel fabricated mitre gates leak badly at centre, sides and penstock valves.



NRA — *National Rivers Authority Anglian Region*	UPPER NENE STRUCTURES – STANWICK A.R.C's RESTORATION PLAN	Balfour Maunsell CONSULTING ENGINEERS	DATE FEB 92	DRAWN BY MDA
			SCALE 1:5000	
			APPENDIX F	

IRTHLINGBOROUGH LOCK

EXISTING WEIR No 2
OPTIONS 2 & 3 - REFURBISH
OPTION 4 - RECONSTRUCT

NAVIGATION CHANNEL.

CHANNEL SIZE INCREASED AS PART OF ARC RESTORATION

PROPOSED LAKE AS ARC'S RESTORATION PLAN

EXISTING BRIDLEWAY.

PROPOSED BRIDLEWAY AS ARC'S RESTORATION PLAN.

EXISTING ACCESS ROAD

PROPOSED BRIDLEWAY DIVERSION AS ARC'S RESTORATION PLAN

STANWICK SLUICES.
(SEE ENLARGED DETAIL ABOVE.)

OPTIONS 2 3 & 4A REFURBISH AND AUTOMATE.
OPTION 4B REPLACE WITH WEIR.

EXISTING WEIR No 1
OPTION 2 - REFURBISH.
OPTION 3 - EXTEND.
OPTION 4 - RECONSTRUCT.

NORMAL WATER LEVEL REDUCED BY 150mm FOR OPTION 4

FROM HIGHAM

0 100 200m
SCALE

OPTION 4B
NEW WEIR AND NEW BRIDGE

ARC PUMP HOUSE

BRICK ARCH BRIDGE.

RIVER NENE

CONCRETE BRIDGE.

TILTING GATE SLUICE.

TRACK

VERTICAL GATE SLUICE.

0 10 20m
SCALE

DETAIL OF SLUICES

NRA
National Rivers Authority
Anglian Region

UPPER NENE STRUCTURES — STANWICK

PROPOSED OPTIONS

Balfour Maunsell
CONSULTING ENGINEERS

DATE: FEB 1992 | DRAWN BY: R.T.
SCALE: SEE BAR SCALES.

APPENDIX G

OPTION 2 - COST ESTIMATE

Refurbish Existing Structures

Item	Description	Cost £'s
1.	Refurbish Weir No. 1 - concrete repair - brickwork repair - downstream bank protection - fill and protect scour hole	19,500
2.	Refurbish Weir No. 2 - joint renewal - fill and protect scour hole - extend gabion bank protection	10,000
3.	Refurbish and automate sluices - repair masonry and concrete - refurbish sluice gates - provide electricity supply - motor drives to sluice gates - upstream water level measurement - telemetry local station	30,000
	sub total	59,500
	Add 10% contingencies	5,950
	Add 25% preliminaries (items 1-3)	14,875
	Contract Cost	80,325
	Design, Supervision and Project Management (15%)	12,050
		92,375
4.	Fees and salaries for project appraisal	8,400
		100,775
	say £101,000	

Capitalized Operating Costs

Fortnightly routine inspection and 6 monthly M & E maintenance	- wages	£1250
	- materials	£ 150
	- electricity	£ 100
		£1500

Net Present Value at 7% for 25 years (11.654 multiplier) £17,500

OPTION 3 - COST ESTIMATE

Refurbish Existing Structures
Extend Weir No. 1 by 37m

Item	Description	Cost £'s
1.	Refurbish Weir No. 1 - as Option 2	19,500
2.	Refurbish Weir No. 2 - as Option 2	10,000
3.	Refurbish and automate sluices - as Option 2	30,000
4.	Excavation to extend weir 1100m^3	5,500
5.	Sheetpiling 450m^2	45,000
6.	Concrete including formwork and reinforcement 520m^3	67,600
7.	Bank protection 500m^2	12,500
	sub total	190,100
	Add 10% contingencies	19,010
	Add 25% preliminaries (items 1-7)	47,525
	Contract Cost	256,635
	Design, Supervision and Project Management (15%)	38,500
		295,135
8.	Fees and salaries for project appraisal	8,400
		303,535
	say £304,000	

Capitalized Operating Costs

Net Present Value (as for Option 2)	17,500

OPTION 4A - COST ESTIMATE

Construct 2 New Weirs and Refurbish Sluices

Item	Description	Cost £'s
1.	Refurbish and automate sluices - as Option 2	30,000
2.	Excavation for 2 weirs 1200m^3 (including demolition of existing weirs)	6,000
3.	Sheetpiling for 2 weirs 470m^2 (some existing may be re-used)	47,000
4.	Concrete including formwork and reinforcing 550m^3	71,500
5.	Bank protection 700m^2	17,500
	sub total	172,000
	Add 10% contingencies	17,200
	Add 25% preliminaries (items 1-5)	43,000
	Contract Price	232,200
	Design, Supervision and Project Management (15%)	34,830
		267,030
6.	Fees and salaries for project appraisal	8,400
		275,430
	say £275,000	
	Capitalized Operating Costs	
	Net Present Value (as for Option 2)	17,500

OPTION 4B - COST ESTIMATE

Construct 3 New Weirs

Item	Description	Cost £'s
1.	Demolition of weirs and sluices.	5,000
2.	Excavation for 3 weirs 1900m^3	9,500
3.	Sheetpiling for 3 weirs 760m^2	76,000
4.	Concrete including formwork and reinforcing 890m^3	115,700
5.	Bank protection 700m^2	17,500
6.	New bridge at old mill site.	14,400
	sub total	238,100
	Add 10% contingencies	23,810
	Add 25% preliminaries (items 1-6)	59,525
	Contract Price	321,435
	Design, Supervision and Project Management (15%)	48,215
		369,650
7.	Fees and salaries for project appraisal	8,400
		378,050
	say £378,000	

SUMMARY TABLE OF OPTIONS

Option	Description	Comments	CAPITAL SCHEME COSTS £ Existing Capacity	1 in 1 Year Capacity	1 in 5 Year Capacity	Operating Costs Net Present Value £
					Includes £20,000 for channel enlargement between Higham and Stanwick.	
1	Do Nothing	key objectives not satisfied				
2	Refurbish Existing Structures includes automation of sluice gates.		101,000			17,500
2A	Refurbish Weirs 1 & 2 Replace Sluices with Weir	no sluices	195,000	-	-	-
3	Refurbish Structures Extend Weir No.1			304,000	445,000	17,500
4A	Refurbish Sluices Construct 2 New Weirs 150mm lower			275,000	400,000	17,500
4B	Construct 3 New Weirs 150mm lower		£266K	378,000	557,000	-

Scheme Justification - Economic Appraisal

The following appraisal has been carried out to help justify work on the Upper Nene. It is assumed that all income from navigation will eventually be lost after a period of 5 years as a result of the deterioration in condition of river control structures, and the subsequent loss of retention levels.

Details of Craft and Licence fees were obtained from the NRA's Licencing Department, and details of Mooring fees from the Estates & Recreation Department.

The 3 classes of craft used are the most popular classes on this river. The assumed distribution of craft size and number is considered the most appropriate.

The number of licences are for use on the R Nene only, no allowance has been made for losses incurred through craft that hold licences for the whole region.

No. of Craft licenced to use R Nene alone in 1992 = 1273.

Licence Fees

Length	Rate £	No.	Total £	
< 7.5m	129	764	98556	
<10.0m	167	254	42418	
<15.0m	284	255	72420	
		1273	213394	per annum

Mooring Fees

Length	Rate £	No.	Total £	
< 7.5m	Assumed to be trailer mounted		0	
<10.0m	260	254	66040	
<15.0m	345	255	87975	
		509	154015	per annum

Registration Fee

Annual Income = £2.00 x 1273 = £2546

Total Loss of Annual Income Due to Fees

Licence Fees	213394
Mooring Fees	154015
Registration Fees	2546
	£369955 (Year 5 onwards)

Compensation

This has been taken as the cost of moving craft to new moorings on other rivers. The rate is to cover the cost of a low loader to move the craft.

£250 x 509 no. = £127,250 (Over the 1st 5 Years)

Loss of Income During Years 1-5

			£	
Year 1	Fees	369955 / 5 =	73,991	
	Compensation	127250 / 5 =	25,450	
			99,441	per annum
Year 5	Fees		369,955	
	Compensation		25,450	
			395,405	per annum

Actual Annual Damage

Discounted at 6% over the 50 year scheme life:-

Year 1 :	99441	x	0.9434	=	93,813
Year 2 :	173432	x	0.8900	=	154,354
Year 3 :	247423	x	0.8396	=	207,736
Year 4 :	321414	x	0.7921	=	254,592
Year 5 :	395405	x	0.7473	=	295,486
Year 6-50 :	369955	x	11.5497	=	4,272,869
			Thus Total	=	£5,278,851

Cost of Control Structure Improvements

Total number of structures on river is 39. Four have already had improvements undertaken; Wellingborough, Woodford, Perio, Upper Ringstead. The cost of these were as follows:-

Wellingborough	£ 300,000
Woodford	£ 310,000
Perio	£ 180,000
Upper Ringstead	£ 165,000
	£ 955,000 Average cost £250,000

It is stated within the strategy for the River Nene model, that the remaining structures would be improved over the next 20 years.

35 structures over the next 20 years equates to a rate of 1.75 structures per annum, each at a cost of £250,000.

Therefore, the annual cost of rehabilitating the structures is:

$$1.75 \times 250{,}000 = £437{,}000$$

This cost to be discounted at 6% over the 20 year period i.e.

$$£437{,}000 \times 11.4701 = £ \underline{5.02 \times 10^6}$$

Benefit:Cost Ratio

$$\frac{5.28 \times 10^6}{5.02 \times 10^6} = 1.05$$

Conclusions

1. As can be seen from the above figures, the Benefit:Cost ratio is above unity.

2. In addition to the tangible costs calculated above, the following intangible costs should be considered as a result of the loss of navigation levels:

   a) The Authority's inability to provide the required statutory navigation levels.
   b) Loss of environmental habitats.
   c) Loss of fishing amenity (also income from National Fishing licences).
   d) Loss of amenity and scenic value of the river and the surrounding area.
   e) Reduction in riverside property prices, both residential and commercial.

APPENDIX J1

Balfour Maunsell Limited
Consulting Engineers

Balfour Maunsell

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Telephone: 0603 633549
Fax: 0603 630228

Resident Manager:
N J Bowers

Our Ref: NAS/SLF/901451

19 February 1992

English Nature
Eastern Region Headquarters
Monkstone House
City Road
Peterborough
PE1 1JY

For the attention of Ms R Parslow

Dear Madam

PROPOSED RECONSTRUCTION OF STANWICK SLUICES AND WEIRS

Thank you for your letter of 13 January regarding the proposed reconstruction of Cotterstock Weir. We look forward to receiving your comments on proposals following in your site visit.

We are also carrying out a feasibility study for rehabilitation/upgrading the control structures on the River Nene at Stanwick near Irthlingborough.

Please find enclosed a location plan and a plan showing proposals.

The options under consideration are:-

a) OPTION 1 - Do nothing.
b) OPTION 2 - Repair and refurbish weirs and sluices.
c) OPTION 3 - Extend weir no. 1 to 50m to cater for 1 year flood.
d) OPTION 4A - Construct new weirs to give a normal water level 150mm lower than existing and refurbish the sluices. Weir no. 1 to be 24m long and Weir No. 2 to be 18m long (existing length).
e) OPTION 4B - As 4A but the sluices to be replaced with a fixed weir including a new bridleway bridge.

The preferred option is 4A with new weirs and a 150mm lowering of the normal water levels. Mr Youdan of NRA informs us that this water lowering may have a beneficial effect on an upstream SSSI.

Please notify us if you can envisage any significant consequences of the above proposals.

If you require any clarification please contact Mr Neil Smith at 0603 633549.

Yours faithfully

N A SMITH
for BALFOUR MAUNSELL LTD

J2

Midlands Regional Office
17th Floor, Cumberland House
Broad Street
Birmingham B15 1TD
Telephone: 021-632 6503
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Our ref.
Your ref. M/216/14
Date 25 February 1992

Mr N A Smith
Balfour Maumsell Ltd
Suite 2
Sackville
44 Magdalen Place
Norwich
NR3 1JU

COUNTRYSIDE COMMISSION

Dear Mr Smith,

PROPOSED RECONSTRUCTION OF STANWICK SLUICES AND WEIRS

I am responding to your letter of 19 February 1992 concerning the above.

I have consulted with the Countryside Stewardship Officer covering Northamptonshire, Paul Arnold, and he has informed me that your proposals could possibly affect two Countryside Stewardship sites in the areas highlighted on your original map (attached).

Site One is an existing Countryside Stewardship scheme. Part of the work carried out has involved creating scrapes and installing sluices in a stream feeding the main river in order to fill the scrapes and flood part of the surrounding land. This area, when it flooded in the recent past, was an important breeding for snipe and it is now hoped to recreate this. Altering water levels in the main river could potentially have a serious effect on this site.

The NRA were involved with constructing the scrapes and sluices here, so they should be aware of any potential adverse effects on this particular site. It may be worth your while rechecking with Tom Youdan of the NRA regarding this site, as I understand that he was off work when the original work on the ground was carried out.

Site Two is a possible scheme for the forthcoming year of Countryside Stewardship involving recreation of a large zone of limestone grassland on the valley side. At the present time we do not see any serious implications here in altering the water level in the river.

The Nene Valley Project Officer, Steve Brayshaw, who is based in the Planning and Transportation Department of Northamptonshire County Council has been involved with both of these sites. It is likely that he would also be able to offer some more detailed comments, and I assume that he will have had the opportunity to see a copy of these proposals.

Ther broader overall comments that I raised in my previous letter of the 7 January 1992 in respect of Cotterstock Weir could also equally apply in this particular case.

COUNTRYSIDE COMMISSION

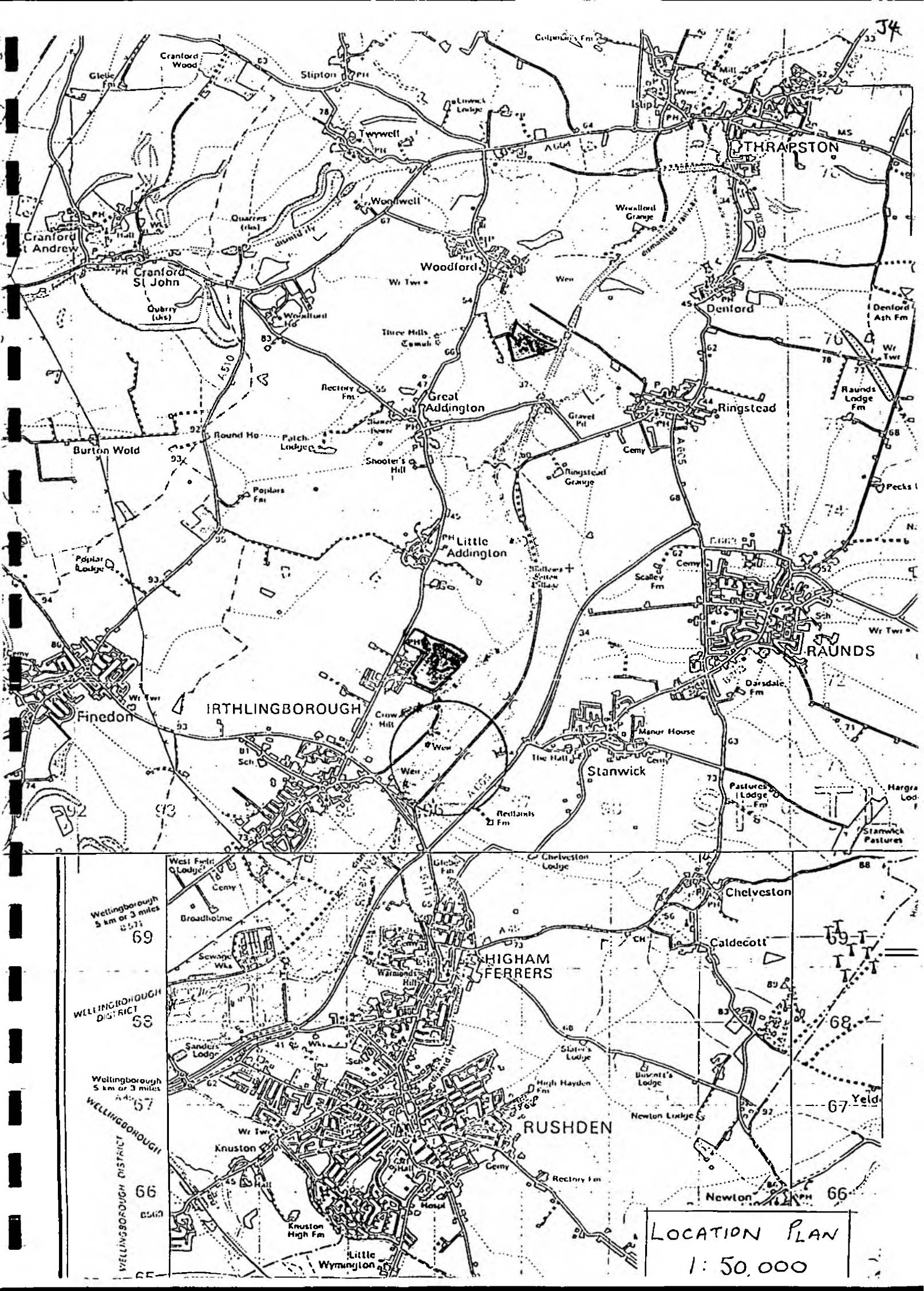
I hope that the above comments have clarified the potential areas of concern for the Commission relating to these particular proposals. At the present stage the Countryside Commission does not have a strong preference for any of the different options which you are considering, but we would appreciate confirmation that your eventual preferred option will not significantly adversely affect the Countryside Stewardship sites which I have highlighted above.

Yours sincerely

David W. Lepper

DAVID W LEPPER
Senior Countryside Officer

cc Paul Arnold
Steve Brayshaw



LOCATION PLAN
1:50,000