

Persons who asked for application forms for new licences were invited first to discuss their proposals, and were advised whether it was likely that a formal application would be rejected, or (subject to any objections which might be received) whether a licence might be granted. This practice has resulted in a number of proposals not being pursued, and has avoided purposeless advertising expenditure.

Twenty applications were received, and were dealt with as follows:

Licences issued	16
Applications refused	2
Applications deferred for further consideration	2

The Table on page 17 contains particulars.

Eight of the applications were from persons who would have been entitled to a Licence of Right had they made application in due time.

In the first year the expedient was adopted of issuing a number of licences for a specified period, unless before the expiration of that period the licence holder was informed that the licence had been extended for a further period. The advantage was that an immediate rejection was avoided while the Authority accumulated data relevant to a full consideration of the application. Three of these licences were allowed to expire while two were extended for a further period.

In considering the seven spray irrigation proposals which were deferred at the end of the previous year pending further consideration, it soon became evident that to avoid derogation from protected rights prospective abstractors would have to provide off-stream storage and take water during winter months only. The applications were refused.

As was stated in the Report of the Water Resources Board on Water Supplies in South East England:

“ In the Welland and Nene area there will be little scope for further direct abstraction of surface water for spray irrigation in dry weather, although the matter is complicated by the practice hitherto of diverting Nene flow into the catchment of the Great Ouse for the maintenance of water levels in the Fens. The effective demand has been assessed and must be met by provision of local farm storage, or by diversion from major surface storage schemes.”

The Tables on page 17 record the Licences not of Right issued during the year, and the Licences not of Right extant at the 31st March.

(b) Impounding Licences

No applications for Impounding Licences have been received.

8. CONSERVATION WORKS

A Water Balance Sheet and Development Plan has been formulated on the assumption that surface and ground water resources will be integrated to enable the maximum possible use to be made of the limestone aquifer. An outline proposal is being discussed with the Water Resources Board.

The Rutland Project

The principal scheme to be surveyed and explored by the end of 1967 as required by the South East Report is that for a reservoir at Manton on the River Chater between Oakham and Uppingham, or at Empingham on the River Gwash between Oakham and Stamford. The Scheme is referred to as the “ Manton and Empingham Scheme,” which implies that two reservoirs might be built in the near future. In fact only one reservoir is required to meet the short

LICENCES NOT OF RIGHT
issued during year

<i>Agriculture (other than spray irrigation)</i>	<i>Agricultural and Horti- cultural Spray irrigation</i>	<i>Industrial Uses Significant losses</i>	<i>Industrial Uses Water cooling Sand and gravel Other minimum losses</i>	<i>Domestic (not exempt)</i>	<i>Public Supply</i>	<i>Miscellaneous</i>	<i>Totals</i>
<i>Authorised annual No. abstraction</i>	<i>Authorised annual No. abstraction</i>	<i>Authorised annual No. abstraction</i>	<i>Authorised annual No. abstraction</i>	<i>Authorised annual No. abstraction</i>	<i>Authorised annual No. abstraction</i>	<i>Authorised annual No. abstraction</i>	<i>Authorised annual No. abstraction</i>
Nene Hydrometric area							
1 2,720	5 4,066	2 77,220	3 1,119,550				11 1,203,556
Welland Hydrometric area							
2 49	2 3,163					1 27,000	5 30,212
3 2,769	7 7,229	2 77,220	3 1,119,550			1 27,000	16 1,233,768

(Quantities in 1000 gallons)

LICENCES NOT OF RIGHT
extant at 31st March 1967

<i>Agriculture (other than spray irrigation)</i>	<i>Agricultural and Horti- cultural Spray irrigation</i>	<i>Industrial Uses Significant losses</i>	<i>Industrial Uses Water cooling Sand and gravel Other minimum losses</i>	<i>Domestic (not exempt)</i>	<i>Public Supply</i>	<i>Miscellaneous</i>	<i>Totals</i>
<i>Authorised annual No. abstraction</i>	<i>Authorised annual No. abstraction</i>	<i>Authorised annual No. abstraction</i>	<i>Authorised annual No. abstraction</i>	<i>Authorised annual No. abstraction</i>	<i>Authorised annual No. abstraction</i>	<i>Authorised annual No. abstraction</i>	<i>Authorised annual No. abstraction</i>
Nene Hydrometric area							
3 3,160	8 21,641	2 77,220	3 1,119,550	2 6,300	4 597,750		22 1,825,621
Welland Hydrometric area							
2 49	3 3,213			1 729	1 365,000	1 27,000	8 395,991
5 3,209	11 24,854	2 77,220	3 1,119,550	3 7,029	5 962,750	1 27,000	30 2,221,612

(Quantities in 1000 gallons)

term demand, and a second one will only be necessary in the long term if a Wash Barrage is not to be built, or if the demand cannot be met from some other large source outside the Area. Manton and Empingham are at present considered as alternative sites, and the proposal is best referred to as the “ Rutland Project.”

The proposal provides for a major abstraction from the River Nene upstream of Peterborough, and for a minor abstraction from the River Welland near Tixover, with some impounding on the River Gwash or the River Chater, according to whether the reservoir is built at Empingham or Manton.

The Scheme was originally envisaged by the Mid-Northamptonshire Water Board some years ago, and that Board were well advanced in a desk study of the problems before the establishment of the Authority. The stage had been reached when a geological investigation was

required, and the result of that will probably prove to be the principal consideration in making the choice between Manton and Empingham. It became apparent that compulsory powers would be needed in order to make the survey, and it was agreed that it would be convenient and more expeditious if an Order under section 8 of the Water Act 1948 was granted to the Water Board. It is hoped that the Consultant Geologist's recommendations on that survey will be available in June 1967, and decisions can then be taken on the administrative arrangements and on the responsibility for the project.

The proposal was originally intended to meet the requirements of the Mid-Northamptonshire Water Board, and although that Board will still make the largest demand on a reservoir, it seems that Leicester City Water Department, Peterborough City Water Undertaking, the Nene and Ouse Water Board, and (if the geological investigation of the Lincolnshire limestone shews that the aquifer is fully exploited) the South Lincolnshire Water Board will also have to look to the Rutland project to augment their resources. The relative demand, and its incidence may vary according to the expansion of Northampton, Corby, Peterborough, Daventry and Wellborough.

Originally it was intended to distribute the water by trunk mains to the several undertakings, and that will still be necessary to supply the Mid-Northamptonshire Water Board and the Leicester City Water Undertaking. But consideration is now being given to the possibility of using the reservoir as a river regulating reservoir to maintain a flow down the River Welland such that the Nene and Ouse Water Board, Peterborough City Water Undertaking, and South Lincolnshire Water Board (if they require it) can abstract water from the river at points in proximity to their areas of distribution. Separate treatment works would be necessary, but there would be a significant saving in trunk pipe lines and in operating costs. The method is in accordance with the present thinking on these problems, and it would increase the safe yield as water would not have to be released from storage solely to provide compensation water or to maintain a prescribed flow in times of low natural flow. It would also provide additional water for spray irrigation until such times as the yield was fully taken up for public water supply.

The surface water records maintained by the Nene River Board since 1939 have been examined, and yield calculations have been made to evaluate the varying probabilities of failure, storage, prescribed flow, and drought. A yield in excess of 50 M.G.D. can be ensured if storage capacity is adequate.

It is necessary that the Reservoir should be in use as soon as possible. The proposal will no doubt be opposed, and it will be said that a Wash Barrage would avoid loss of agricultural land of some 3,000 acres at Empingham and some 1,600 acres at Manton. It cannot be emphasized too strongly that a Wash Barrage could not possibly make this project unnecessary, as water will be required to meet the short term deficit long before any supply could be obtained from the Wash. It is hoped that any opposition to the Scheme will not be founded on false premises.

Sywell Reservoir (Higham Ferrers and Rushden Water Board)

A superficial report has been obtained from a Consultant Geologist on the possibility of expanding the storage capacity of Sywell Reservoir by building a new embankment further down the valley. The provisional advice is that it would be possible, and test pumping is to be carried out to see whether there is sufficient yield from the gravel pits adjacent to the River Nene at Earls Barton as would enable the reservoir to be augmented by pumped storage.

Blatherwycke Lake

Blatherwycke Lake is part of the water supply system for the Corby Steel Works of Stewarts & Lloyds Ltd., and the possibility of making greater use of the water by recirculation is being considered.

Whittlesey Clay Pits

Whittlesey Clay pits are in close proximity to the River Nene and the subsidiary channel of Moreton's Leam, some being in this Area and others being in the Great Ouse Area. In consultation with the Great Ouse River Authority consideration is being given to the possibility of using the Clay Pits for the storage of water abstracted on peak flows from the River Nene below Peterborough. The principal use of water so stored would be to augment the resources available for spray irrigation in the Fenland.

Billing Brook

The Consulting Engineers retained to consider the Civil Engineering problems arising on the proposed expansion of Peterborough suggested that a small pumped storage reservoir might be built on the Billing Brook, some five miles upstream of Peterborough, with an abstraction from the River Nene. The Consultants have been asked for further particulars, but it is considered that the capacity of the reservoir would be inadequate to meet the needs of Peterborough when the population has been doubled. It appears that the requirements could best be met from the Rutland Project, and that a reservoir on the Billing Brook could only detract from the advantages of that.

Re-use of industrial water

Stewarts & Lloyds Ltd. have installed a water treatment plant to recover trade effluent for re-use in the Corby Steel Works.

Effluent from the strip rolling mills, which was previously discharged to the stream, contains large quantities of scale of varying particle size. The scale is removed by screening, coagulation and settling. The plant has a capacity of 7,000 gallons per minute and is one of the largest of this type yet constructed. The works use 250 M.G.D. over and over again, and the plant would result in a net saving of 2 M.G.D.

9. AGREEMENTS UNDER SECTION 81 AND ORDERS UNDER SECTION 82

No agreements or orders have been made under Section 81 and 82.

10. CHARGES

It was decided that the proper approach to interim charges negotiated under section 62 was to formulate provisionally the permanent Scheme to be brought into operation in 1969 under section 58. This provisional scheme might have to be modified or amended in the light of experience in the intervening period and in accordance with any guidance which might be forthcoming after negotiations at national level. But in the meantime it could be used as a basis for negotiating interim charges, and if such modifications and amendments as eventually prove to be necessary are not substantial then transitional difficulties will be avoided or minimised.

It is not considered necessary in the circumstances prevailing in this Area to distinguish between the various non-tidal rivers, or between the cleaner water and the not so clean water.

The "source of supply" characteristics (Section 58 (4) (a)) have been divided into four categories, with ratios as indicated:

Non tidal rivers and streams	ratio	4.
Tidal rivers	ratio	0.4
Ground Water	ratio	1.
Artificial watercourses (not being subsidiary channels to a river or stream) and drains in internal drainage districts	ratio	6.

Some abstractions from shallow wells (particularly in the Nene Valley gravels) apparently of ground water are in fact very definitely and directly affected by the level of the river in proximity, as from time to time the Nene River Board were asked to so regulate the river or to so programme maintenance work as not to reduce the water level in the underlying gravels. The

right is reserved to consider such abstractions for the purpose of the Charging Scheme as abstractions of surface water.

The “seasonal” characteristic (Section 58 (4) (b)) has been divided into three categories, with ratios as indicated:

- An “annual” abstraction, being an abstraction made regularly and at a substantially constant rate in every month of the year .. ratio 5.
- A “winter” abstraction, being an abstraction made only between 1st October and 31st March .. ratio 1.
- A “summer” abstraction being an abstraction not falling within the other two definitions .. ratio 10.

It appears that some spray irrigators do take water as early as March, and the definition of “summer abstraction” may have to be amended to take account of that.

The purpose for which the water is used (Section 58 (4) (c)) and the way in which the water is disposed of (Section 58 (4) (d)) have been considered as one, and the “use” characteristics have been divided into three groups, with ratios as indicated:

- Group I. Water for cooling purposes, sand and gravel washing, and other purposes where the water is returned direct to the river with a loss in volume not exceeding 10 per cent .. ratio 5.
- Group II. Public water supply, and industrial and other uses not falling in Group I or Group III. .. ratio 25.
- Group III. Spray irrigation, and other purposes resulting in a loss or volume of more than 90 per cent .. ratio 100.

From the above ratios the Table below was constructed to give 28 unit values. A group II annual abstraction from a surface source was expressed as “unity”, so that all charges could readily be related to that for public water supply.

NON-TIDAL WATERS												Tidal Waters
		Winter 1				Summer 10			Yearly 5			
			Rivers and Streams	Ground Water	Artificial Water- courses and Fen Drains	Rivers and Streams	Ground Water	Artificial Water- courses and Fen Drains	Rivers and Streams	Ground Water	Artificial Water- courses and Fen Drains	
Group	Use or loss	Ratio	4	1	6	4	1	6	4	1	6	0.4
I	Cooling water sand and gravel washing and uses not resulting in loss of more than 10%	5	0.04	0.01	0.06	0.4	0.1	0.6	0.2	0.05	0.3	
II	Public Water Supply, Industrial abstractions and other uses not falling in Groups I or III	25	0.2	0.05	0.3	2.0	0.5	3.0	1.0	0.25	1.5	0.004
III	Spray irrigation and uses resulting in a loss of more than 90%	100	0.8	0.2	1.2	8.0	2.0	12.0	4.0	1.0	6.0	

To convert the table to terms of pence per thousand gallons, each unit value will be multiplied by the total volume of water (in thousand gallons) abstracted in relation thereto to give “kilo-units” for each of the 28 classifications for which there may be an abstraction, and the kilo-units for each classification will then be added together to give a total of kilo-units for all chargeable abstractions. The estimated total cost of water conservation work in any year will then be divided by the sum of the kilo-units to give a figure in pence per thousand gallons for one unit.

The first appreciation of the chargeable licensed abstractions shewed that some 78,460 million gallons (actual) of water are at present abstracted, and that the value in kilo-units is 41, 224, 333.

The present overall expenditure on water conservation work is estimated at £50,000 a year, and dividing that amount by the sum of the kilo-units produces a charge per one unit of 0.29 pence—that being the charge per one thousand gallons for a Group II annual abstraction from river or stream. A Group I annual abstraction (cooling water) from a river or stream will thus be assessed at 0.058d., and a Group III summer abstraction (spray irrigation) from a river or stream will thus be assessed at 2.32d.

By way of illustration, this method would produce total annual charges as follows:

Public water supply	..	Annual from a river	..	500 million gallons	..	£ 604
Industry	Annual from a river	..	240 million gallons	..	290
Public water supply	..	Annual from a borehole	..	200 million gallons	..	60
Spray irrigation	..	Summer from a river	..	9 million gallons	..	87

It must be emphasized that these proposals are only tentative at this stage, and may be modified in the light of experience. The British Waterworks Association, the Confederation of British Industries, and the National Farmers’ Union were consulted, and (while reserving their position pending negotiations at National level) they generally approved the proposals as a basis for negotiating interim charges. In fact all licence holders chargeable under section 62 have agreed to pay interim charges accordingly.

No spray irrigator has yet elected to pay on the “two part tariff” under section 63. The present thinking is that for that purpose the Group III charge should be broken into two parts as follows:

- First, there would be a “basic” charge for the quantity authorised by the Licence at the rate applicable to a Group II abstraction in the same relative circumstances. This would be subject to a minimum payment of £5.
- Second, there would be a supplemental charge for the water actually abstracted, which would be at the normal Group III rate less the basic charge.

The logic of the method is that, if the water had not been reserved for spray irrigation it might have been available for a Group II abstraction, and the Authority would not therefore be deprived of revenue which might otherwise have been received from a Group II abstractor.

RAINFALL GAUGING STATIONS
RECORDS TAKEN BY THE AUTHORITY

Station	National Grid Reference	Station No. B.R.O.	Height of gauge above sea level in feet	Duration of records
Surfleet Reservoir *	TF 280.293	156328	12	3 years
Oundle (Nene Wharf) *	TL 044.888	163092	66	34 years
Oundle (Head Office) *	TL 042.883	163091	106	2 years
Wellingborough (Nene Wharf) .. *	SP 899.664	160801	136	34 years
Northampton (South Bridge)	SP 755.595	—	197	34 years

RECORDS SUPPLIED TO THE AUTHORITY BY OTHER PERSONS OR ORGANIZATIONS

Hovenden House *	TF 398.262	156940	15	7 years
A. H. Worth (Fleet) Ltd.				
Bingham Lodge, Mr. F. H. Bowser ..	TF 391.322	157045	10	34 years
Manor Farm, Mr. F. H. Bowser ..	TF 355.241	156677	10	34 years
Fosdyke (Major's Farm) *†	TF 346.310	156836	12	12 years
H. C. C. Tinsley, Ltd.				
Algarkirk, Messrs. Denis's Farms Ltd. . .	TF 311.355	—	12	3 years
Spalding, South Holland Land Drainage Boards	* TF 259.239	154773	10	10 years
Weston, Mr. C. Ostler *	TF 275.184	166114	10	23 years
Pode Hole, Deeping Fen, Spalding and Pinchbeck I.D.B.	TF 214.219	154720	12	139 years
Tongue End, Deeping Fen, Spalding and Pinchbeck I.D.B.	TF 151.185	156194	11	19 years
Deeping St. Nicholas, T. R. Pick, Ltd. †	TF 213.157	154528	10	47 years
Peterborough S. Works, Peterborough Corporation †	TF 201.984	164364	10	32 years
Sutton Bridge, South Holland D.B. .. *†	TF 476.201	166869	21	52 years
Norfolk House Farm, Mr. J. E. Piccaver	TF 441.287	—	11	7 years
Clifton's Bridge, Mr. C. Richardson .. *	TF 379.189	166553	8	5 years
Sutton St. James,	TF 389.181	166569	5	commenced Jan. 1967
South Holland Drainage Board				
Gedney Hill, Mr. A. Depear	TF 337.118	—	8	3 years
Deeping St. James, Mr. W. Holden .. *	TF 148.096	153837	21	2 years
Marholm, Mr. Smedley	TF 155.024	—	50	3 years
Ufford, Mr. G. W. Vergette *	TF 095.040	153905	120	3 years
Wilsthorpe, Peterborough Corporation . .	TF 081.148	—	50	5 years
Lound, South Kesteven R.D.C. *	TF 079.194	156215	134	5 years
Welby, Miss R. A. Mitchell *	SK 975.383	155491	330	5 years
Ropsley, Mr. R. Doughty *	SK 993.341	155588	251	3 years

Station	National Grid Reference	Station No. B.R.O.	Height of gauge above sea level in feet	Duration of records
Irnhem, Irnhem Estates *†	TF 022.265	155742	220	27 years
Clipsham, Mr. G. F. Skillington .. *\$	SK 969.163	155234	305	3 years
Stamford S. Works, Stamford Corp. .. *	TF 041.075	153155	77	5 years
Tickencote, Mr. H. G. H. Bullimore .. *	SK 990.095	153659	139	5 years
Tixover, Nene and Ouse Water Board ..	SK 974.001	152742	104	5 years
Seaton, Mr. R. E. Richardson *	SP 908.977	152542	150	26 years
Oakham, Agricultural Executive Com. *	SK 863.085	153334	350	25 years
Gunthorpe Hall, Mr. R. Thorpe .. *†	SK 869.057	153244	420	19 years
Uppingham, Mr. G. E. Stokes .. *†	SP 859.998	152367	535	10 years
Caldecott, Messrs. Stewarts & Lloyds Ltd.†	SP 864.932	4341	174	10 years
Hallaton, Mr. W. T. Mowsen *	SP 789.967	151874	353	3 years
Ashley, Mr. T. Kerby *	SP 796.908	151845	241	3 years
Great Bowden, Mr. R. J. Oliver ..	SP 746.888	151347	250	6 years
Market Harborough	SP 733.879	151238	345	26 years
Mr. A. D. F. Wooldridge				
Market Harborough U.D.C. †	SP 735.870	151237	260	61 years
Kibworth Harcourt, Mrs. A. M. Briggs †	SP 682.945	151472	408	47 years
Sibbertoft, Mr. E. J. Middleton *	SP 681.826	151026	560	3 years
Apethorpe, Messrs. William Tomkins Ltd.*	TL 022.961	163737	128	18 years
Corby, Messrs. Stewarts & Lloyds Ltd. *	SP 901.885	163465	320	30 years
Harrowden Hall, Mr. A. W. Gilbey *	SP 882.709	161562	291	23 years
Lamport Hall, Sir Gyles Isham *	SP 759.746	159493	481	30 years
Northampton Power Station, Central Electricity Generating Board *	SP 762.598	160204	190	32 years
Orlingbury, Messrs. William Tomkins* Ltd.	SP 843.715	161496	389	10 years
Bugbrooke Mill, Messrs. Heygates Ltd. *	SP 680.588	158802	229	16 years
Litchborough Rectory, Mr. M. Etheridge*†	SP 633.542	158712	486	30 years
Stanground Sluice, Middle Level Commissioners	TL 209.973	196880	16	61 years
Raunds, Mr. T. C. Smith	SP 991.721	4382	194	26 years
Wollaston, Messrs. Scott Bader & Co. Ltd.*	SP 911.631	160775	277	11 years
Blisworth, British Waterways Board ..	SP 720.550	159147	297	17 years
Norton Junction, British Waterways Bd.	SP 602.657	158443	359	17 years
Badby (Primary School), Mr. N. J. Lucas	SP 559.590	158024	441	9 years
Brigstock, Messrs. Stewarts & Lloyds* Minerals Ltd.	SP 944.852	162681	171	9 years
Kelmarsh Hall, Col. C. G. Lancaster, M.P.*	SP 735.795	160838	413	8 years

Station	National Grid Reference	Station No. B.R.O.	Height of gauge above sea level in feet	Duration of records
Bulwick Hall, Mr. G. T. G. Conant ..*	SP 958.940	163646	225	9 years
Yardley Hastings, Forestry Commission§*	SP 852.572	160521	332	8 years
Flore, Mr. J. Champion*	SP 649.601	158618	285	43 years
Orton Longueville Grammar School ..	TL 165.965	—	51	6 years
Duston (Primary School)	SP 717.623	—	327	2 year
Mr. F. W. Harrison				
Islip Furnaces, Stewarts and Lloyds Ltd.	SP 970.783	—	163	53 years

* Returns from these stations are made to the British Rainfall Organisation.
† Indicates that all records relating to stations are not available at Head Office.
‡ Break in records, July to December 1964 and June to August 1965.
§ Existing site, records are available for nearby site for previous 9 years.
|| Records ceased in October 1966.
\$ Records ceased in July 1966.

RAINFALL FOR 1966

River Nene Hydrometric Area

1966	Above Northampton (Litchborough)	Northampton (Hardingstone)	Wellingborough (Nene Wharf)	Oundle (Nene Wharf)	Peterborough (Stanground)
	inches	inches	inches	inches	inches
January	1.06	1.11	1.19	1.09	1.06
February	3.10	3.04	2.74	3.22	2.74
March	0.77	0.39	0.27	0.29	0.35
April	3.64	3.33	3.17	3.30	2.98
May	2.15	1.82	1.78	1.61	1.40
June	2.95	3.13	2.45	2.89	2.81
July	2.38	2.29	2.44	2.44	2.66
August	3.08	3.80	3.13	3.94	3.86
September	1.62	1.54	2.13	1.77	1.41
October	4.83	3.66	2.66	2.94	1.76
November	2.00	1.80	2.05	1.92	2.10
December	3.75	3.00	2.74	2.66	2.69
1966 Total ..	31.33	28.91	26.75	28.07	25.82
1965	30.62	26.79	24.09	24.12	25.30
1964	17.42	15.63	15.41	16.68	17.54
1963	22.58	22.13	20.97	22.83	19.74
1962	22.11	18.48	18.08	17.81	16.59
Average 1916-1950	25.99	22.95	23.07	23.09	21.72

Comparative Table

Year	Per cent of average
1966	121
1965	112
1964	71
1963	93
1962	80

RAINFALL FOR 1966

River Welland Hydrometric Area

1966	Market Harborough	Caldecott Pumping Station	Oakham (River Gwash)	Irnham (River Glen)	Pode Hole (Fen Area)
	inches	inches	inches	inches	inches
January	1.04	0.96	1.15	1.40	1.17
February	3.71	2.65	3.71	3.60	2.98
March	0.47	0.38	0.51	0.71	0.39
April	3.26	2.99	3.33	3.12	3.14
May	2.10	1.47	1.84	1.79	1.77
June	1.99	2.09	2.28	3.53	3.26
July	2.28	2.18	2.06	2.19	1.98
August	4.67	3.85	3.49	4.51	3.11
September	1.20	1.40	1.43	0.92	1.85
October	3.42	2.37	2.52	2.74	2.69
November	1.85	1.83	1.91	2.23	1.97
December	3.01	2.66	3.32	2.61	2.19
1966 Total ..	29.00	24.83	27.55	29.35	26.50
1965	29.53	24.62	32.98	28.68	25.96
1964	18.02	15.85	20.39	18.10	16.77
1963	21.73	19.51	21.84	21.21	20.14
1962	20.55	17.44	19.68	21.22	18.33
Average 1916-1950	24.33	22.66	24.68	24.45	23.70

Comparative Table

Year	Per cent of average
1966	114
1965	118
1964	74
1963	87
1962	81

RIVER AND STREAM GAUGING

(a) Automatic Gauging Stations recording water level and rate of discharge

Station	M= Main River T= Tributary	National Grid Reference	Catchment Area in Sq. Miles	Type of Measurement	Duration of Records
WELLAND CATCHMENT					
Kate's Bridge	T	TF 106.149	132	Standing-wave flume	8 years
King Street Bridge	T	TF 109.106	132	Standing-wave flume	7 years
Tixover	M	SP 971.998	156	Current meter (over 150 cusecs)	5 years
Tallington Lolham Mill Stream	M	TF 096.078	273	Simple Crump-type weir	Records began July 66
West Deeping Mill Stream	M	TF 094.078	273	Simple Crump-type weir	Records began July 66
Belmesthorpe	T	TF 038.097	57.9	Simple Crump-type weir	Records began 31st Mar. 67
NENE CATCHMENT					
Orton	M	TL 166.972	631	Weir and sluices (to approx. 1,000 cusecs)	27 years
Wansford	M	TL 080.995	590	Current meter (over 1,000 cusecs)	28 years
Willow Brook	T	TL 067.933	34.6	Standing-wave flume	28 years
Harper's Brook	T	SP 983.799	28.7	Compound Crump-type weir	28 years
Harrowden	T	SP 898.715	74.9	Compound Crump-type Weir	23 years
Wollaston	M	SP 887.647	249	Weir (below 60 cusecs)	23 years
Northampton	M	SP 755.597	220	Current meter (over 1,000 cusecs)	Level for 33 years. Discharge occasional for 24 years
St. Andrews	T	SP 747.617	89.9	Standing-wave flume	28 years
Upton	T	SP 721.592	86.1	Standing-wave flume	27 years
Dodford	T	SP 627.607	41.3	Simple Crump type weir §	22 years

§ As from December 1966.
The above returns, other than those for Tixover, Northampton and Wansford (where only intermittent flood discharges are recorded) and Wollaston (where some drought discharges are registered) are published in the Surface Water Year Book.
When the Greatford Flood Relief Channel is in use, the natural discharge of the River Glen at Kate's Bridge is obtained by adding the discharges at Kate's Bridge and King Street.

(b) Recording Stations—water levels

Station	National Grid Reference	River	Type	Duration of records
Fosdyke, Spalding ..	TF 318.323	Welland	Tidal	17 years
Marsh Road, Spalding ..	TF 259.241	Welland	Tidal	Intermittent from December 1953
Marsh Road, Spalding ..	TF 260.240	Welland	Freshwater	13 years
Cowbit Road, Spalding ..	TF 246.217	Welland	Freshwater	14 years
Dog-in-a-Doublet Lock and Sluices	TL 272.993	Nene	Tidal	Intermittent 1946-56. Continuous from December 1957
Lynn Road Piling, Wisbech ..†	TF 460.103	Nene	Tidal	9 years
Sutton Bridge ..	TF 482.210	Nene	Tidal	Records substantially complete 1937-48. Continuous from May 1958

† Intermittent records are available for an adjacent site (TF 459.103) from 1946 to 1956.

(c) Staff Gauges

Station	National Grid Reference	Normal water level to Newlyn Datum	Duration of records
Dog-in-a-Doublet Lock and Sluices ..	TL 272.993	9.5	28 years
Guyhirne Sluice, upstream and downstream ..	TF 397.029	Varies with season	28 years
Little Bridge (Moreton's Leam), Whittlesey ..	TL 273.984	Varies with season	27 years
Stanground Sluice ..	TL 209.974	D/s Varies with season U/s 9.5	61 years
Peterborough Bridge ..	TL 193.982	9.5	30 years
Water Newton, upstream and downstream ..	TL 110.974	U/s 26.5 D/s 20.7	29 years
Nene Wharf, Oundle ..	TL 043.888	61.5	34 years
Nene Wharf, Wellingborough ..	SP 898.663	129.4	33 years
Northampton Generating Station ..	SP 762.599	183.6	31 years
Northampton South Bridge ..	SP 755.597	187.7	33 years
Weedon ..	SP 632.598	253.3	28 years
Surfleet ..	TF 279.293	Varies with season	27 years

Water levels are read daily at 09.00 hours G.M.T. at these stations.

	ST. ANDREWS (Brampton Branch)								
	1964-65			1965-66			1966-67		
	cusecs	m.g.d.	m³/sec.	cusecs	m.g.d.	m³/sec.	cusecs	m.g.d.	m³/sec.
April	52.05	28.00	1.47	21.74	11.70	0.61	87.48	47.06	2.47
May	27.84	14.98	0.79	15.34	8.25	0.43	41.99	22.59	1.19
June	14.61	7.86	0.41	10.05	5.41	0.28	21.79	11.72	0.62
July	8.42	4.53	0.24	9.21	4.95	0.26	13.88	7.47	0.39
August	7.26	3.91	0.21	8.64	4.65	0.24	20.29	10.92	0.57
September ..	7.70	4.14	0.22	21.14	11.37	0.60	18.77	10.10	0.53
October	9.56	5.14	0.27	18.34	9.87	0.52	61.14	32.89	1.73
November ..	7.60	4.09	0.21	37.20	20.01	1.05	47.15	25.37	1.33
December ..	9.50	5.11	0.27	132.4	71.23	3.75	112.8	60.69	3.19
January	19.16	10.31	0.54	59.59	32.06	1.69	54.97	29.57	1.55
February	9.51	5.12	0.27	109.1	58.70	3.09	75.36	40.54	2.13
March	38.50	20.71	1.09	44.90	24.16	1.27	63.79	34.32	1.80
Monthly Av'ge.	17.64	9.49	0.50	40.64	21.86	1.15	51.62	27.77	1.46
*1940-60 Av'ge.	45 cusecs—24.21 m.g.d.—1.27 m³/sec.								

* Average based on Water Year
m³/sec.= cubic metre/second.

Comparative Table

Year	Per cent of average
1966-67	108
1965-66	121
1964-65	45
1963-64	81
1962-63	58

RIVER DISCHARGE
WELLAND HYDROMETRIC AREA

	RIVER GLEN discharge at KATE'S BRIDGE								
	1964-65			1965-66			1966-67		
	cusecs	m.g.d.	m³/sec.	cusecs	m.g.d.	m³/sec.	cusecs	m.g.d.	m³/sec.
April	71.38	38.40	2.02	17.77	9.56	0.50	68.17	36.67	1.93
May	41.17	22.15	1.16	16.79	9.03	0.47	34.50	18.56	0.98
June	23.84	12.83	0.67	11.30	6.08	0.32	18.18	9.78	0.51
July	15.67	8.43	0.44	3.69	1.98	0.10	11.61	6.25	0.33
August	14.08	7.57	0.40	4.24	2.28	0.12	13.59	7.31	0.38
September ..	14.37	7.73	0.41	8.88	4.78	0.25	16.85	9.06	0.48
October	14.48	7.79	0.41	9.54	5.13	0.27	27.27	14.67	0.77
November ..	14.52	7.81	0.41	33.78	18.17	0.96	49.03	26.38	1.39
December ..	14.75	7.93	0.42	179.8	96.73	5.09	58.93	31.70	1.67
January	13.10	7.05	0.37	121.1	65.15	3.43	71.47	38.45	2.02
February	13.17	7.08	0.37	207.9	111.8	5.88	70.83	38.11	2.00
March	40.90	22.00	1.16	91.09	49.01	2.58	68.16	36.67	1.93
Monthly Av'ge.	24.29	13.07	0.69	58.82	31.64	1.66	42.38	22.80	1.20
*1961-65 Av'ge.	25.09 cusecs—13.50 m.g.d.—0.71 m³/sec.								

* Average based on Water Year.
m³/sec.= cubic metre/second.

Comparative Table

Year	Per cent of average
1966-67	169
1965-66	234
1964-65	97
1963-64	141
1962-63	112

When the Greatford Flood Relief Channel is in use, the natural discharge of the River Glen at Kates' Bridge is obtained by adding the discharges at Kate's Bridge and King Street.

LAND DRAINAGE

1. CAPITAL WORKS

(i) General Account and Progress Report

Welland Outfall Works. LDW. 17319, 17638, 18568, 18821, 19656, 20307, 21011, 21803, 21940, 22606, 22875. Estimated cost: £480,276.

Work continued on this Scheme which commenced in 1960. During the year 20,940 tons of stone were transported by barge from Fosdyke, often under difficult and adverse weather conditions, and placed on the training walls. At least two miles of the left hand (or north) wall and about three miles of the right hand wall bound the outmarsh which has not yet accreted to its ultimate level, and the danger remains that the seaward end of both walls may be damaged from behind. The ebb flow from Kirton and Frampton Marshes on the left side, especially when coupled with a strong flow of inland water from adjacent Internal Drainage districts, tends to seek outlets through the new wall and causes settlement and scour. It was necessary to provide some additional protection work around the Kirton outfall to confine the creek to its defined channel through the left hand training wall.

It now appears that the quantity of stone required for the right hand training wall will be less than was originally anticipated, but the saving will be absorbed by additional requirements on the left hand training wall. Stone groynes placed on the landward side of the left hand wall near Bank End continued to check erosion and encourage accretion.

The Scheme provides for fagot protection for the batters between Fosdyke Bridge and Holbeach Outfall Sluice, and the first part of that work commenced at the end of January.

R. Welland, Crowland and Cowbit Washes Pumping Station, LDW. 22920. Estimated cost: £27,473.

Following the designation of the New River as "main river", responsibility for this scheme was taken over from Deeping Fen, Spalding and Pinchbeck Internal Drainage Board, who had prepared it and were about to start work. The plant will consist of a 27 inch vertical spindle axial flow type pump electrically driven with automatic controls, and the channel is to be improved.

Work commenced in December, and satisfactory progress was made on the foundations.

Kirton and Frampton Sea Banks. LDW 20360. Estimated cost : £40,016.

Only limited work was carried out. It is hoped to complete the short remaining length of bank at the Kirton Triangle in 1967 when the pumping station is finished, as the outfall tunnel is to pass through the new bank.

Sea Bank (1948) Holbeach Marsh. LDW. 22256. Estimated Cost: £4,200.

The principal work was completed. The new *Famliner* sheeting was repaired following some storm damage in September, but the provision of additional soil and turf protection appears to have made the bank secure.

Welland Fascine Works, South Bank. LDW. 21682, 22104, 22870. Estimated Cost: £9,295 for sections 2, 3 and 4

Work continued on fagot protection Schemes in the tidal compartment upstream of Fosdyke Bridge. Scheme No. 4. at Cowhirne (downstream of Marsh Road Sluices) was commenced before Scheme No. 3. in view of the severe erosion which had developed at the foot of the tidal river bank.

R. Welland, Tidal Section Pumping Stations. Estimated cost: £240,462.

At Risegate Eau Pumping Station some stone pitching was carried out to check erosion at the outfall culvert, but further work on the concrete apron at the discharge pipes has to be completed.

R. Welland, Locks Mill to Folly River Fascines. LDW 20784, 21428. 22103, 23050. Estimated cost: £31,339.

Work on section 3 (LDW 22103) is nearing completion, and materials were assembled for Section 4. Bank protection work on the non-tidal section of the River Welland is carried out in Spring and Autumn, as it involves lowering the river level to place fagots along the frontage of the Cowbit Wash Cradge Bank.

River Glen Improvement. LDW. 16111. Estimated cost: £205,279.

Construction of the flood protection wall continued in the vicinity of Boarden Bridge and Bars Bridge, and it is anticipated that the work will be completed in 1967/68.

Bourne Eau Pumping Station. LDW 18660. Estimated cost: £45,800.

The station was operated as required, and no difficulty was experienced in controlling water level in the Bourne Eau. It was of marked value in reducing seepage into the Bourne and Thurlby sub-district of the Deeping Fen, Spalding and Pinchbeck Internal Drainage Board, and also in preventing overflow via the Weir Dyke into the Black Sluice Internal Drainage District.

R. Welland, Lolham Mill Sluice. LDW 22092. Estimated cost: £1,431.

The scheme was completed in June.

Car Dyke North Arm. LDW 21012. Estimated cost: £20,390.

The scheme provides for the diversion around the outskirts of Bourne of the North Arm of the Car Dyke to remedy flooding in an urban area. Negotiations for the land necessitated some modification of the original proposals and are proceeding. The main road culvert has been completed. A Contractor was employed to thrust bore the 72 inch diameter tubes beneath Manning Road. Some difficulty was experienced when rock was encountered at a higher level than had been anticipated, and the proximity of a trunk water main prohibited the use of explosives. Steady progress was maintained under unfavourable weather and site conditions.

West Glen. LDW 21683. Estimated cost: £21,518.

A further section of the scheme for the improvement of the channel between Aunby and Creeton was approved for grant aid, and work commenced in February.

River Gwash Improvement. LDW 20980. Estimated cost: £23,050.

Very satisfactory progress was made, and by the end of the year improvement work had