HUMAN PRESSURES

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INTRODUCTION

Murray in his book on Romney Marsh published in 1953 says of Dungeness "However it may have been formed, whatever may be its future, Dungeness is unique. On that account alone, as one of the seven wonders of Britain, it is worthy of a visit. But there is so much more to it than geography; it has such charm, such spaciousness, such wildness; it is a desert island between the surrounding sea and the dreamy levels of The Marsh; it has its own exquisite flora, its rare birds, its insects; it is a place where few come or go". I wonder what Murray would make of Dungeness in 1985.

Figure 1 shows the boundary of the area currently notified as a Site of Special Scientific Interest, together with the major land ownership/user parcels.

HISTORICAL BACKGROUND

Up to the middle of the nineteenth century human pressures are likely to have been of low intensity when compared with modern developments. Hubbard (1970) records that the area of natural heathlands is likely to have been grazed for centuries, particularly during periods of very high tides when grazing animals would have moved from the marshland areas onto higher ground. Undoubtedly sheep, horses, pigs, rabbits and possibly goats have also grazed parts of Dungeness over the years (Peterken & Hubbard, 1972).

The other historical aspect of man's influence is of marine origin; sailors anchoring off Dungeness and going ashore to collect gulls' eggs and enjoy the hostelries scattered around the Ness, such as the former Hope and Anchor at the end of Denge Marsh Road.

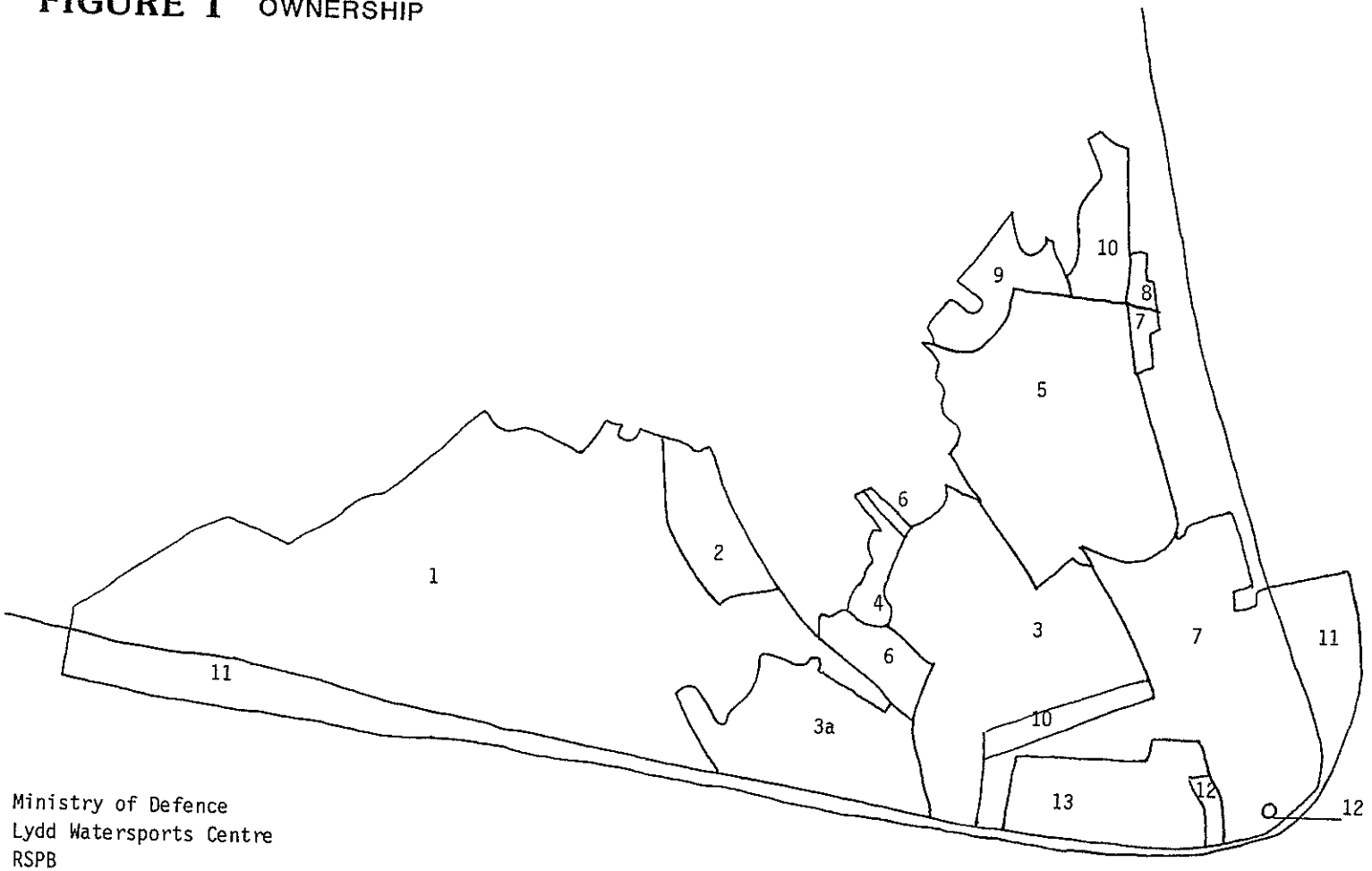
CURRENT PRESSURES

Military Training

The first references to artillery batteries at Dungeness date back to 1798 (Col. West pers. comm.). The outline chronology provided by West indicates that Lydd Camp construction began in 1879, was followed by the building of a substantial length of railway across the Ranges in 1882, and expansion of the camp in 1886 for Heavy Artillery. References to the Royal Artillery during World War I, the Royal Tank Corps between the Wars, and the development of Lydd as the major anti-tank range in World War II, indicate the scale and likely effect of the military presence. In addition anti-tank ditches and lines of mine-craters reveal some of the defensive measures undertaken in World War II. A summary of Lydd's early history is given by Rockett (1983).

Today the Ranges cover approximately 1150 ha (2842 acres) including an additional area which has been leased from the Royal Society for the Protection of Birds in recent years. Since 1964 they have formed part of the Cinque Ports Training Area and catered for an increasing military

FIGURE 1 OWNERSHIP



1 Ministry of Defence
2 Lydd Watersports Centre
3 RSPB
3a RSPB - lease
4 Mixconcrete
5 Folkestone and District Water Co
6 Private Ownership
7 Dungeness Estate
8 Romney Sands Holiday Village
9 Hards Travel
10 ARC
11 Lydd Town Council
12 Corpn. of Trinity House
13 CEGB

usage. The Range complexes are now used for approximately 320 days per year, and the total annual throughput of the Cinque Ports Training Area is in the order of 0.5 million man training days. Col. West considers that the Hythe and Lydd Ranges are probably the most intensively used small arms ranges in the UK and perhaps in the world. Although the Ministry of Defence have nearly completed a major development/re-development programme for the Ranges, further intensification is anticipated. I understand that M.O.D. have decided to concentrate training on certain areas while others may become redundant. Lydd is one of the selected areas and, due to its substantial sea danger area (following a review of safety procedures), is regarded as having considerable scope for further development and expansion. Yet virtually all of the Ranges lie within the area notified as a Site of Special Scientific interest.

Substantial parts of the existing Ranges (besides other areas of Dungeness) have suffered degradation through military training, resulting in the loss of vegetation, removal of shingle ridges, drying out of marshland areas and general disturbance. However, Andrew Henderson's paper in these proceedings (Henderson, this report) shows that relatively undisturbed fragments of the Ranges survive, and overall they are still of significant nature conservation interest.

Extraction of Aggregates

Dungeness is considered by Kent County Council (1982) to be a strategically important source of sand and gravel. Dungeness has one of the most extensive reserves in south-east England, and is the only major source of concreting aggregates in the region.

It is regarded (Southern Water Authority, et al. 1984) as an ideal source of material for construction because of its thickness, high quality and ease of working, and yields of up to 100 000 tonnes per hectare can be achieved. Not surprisingly, Dungeness contributes approximately 25% of the total sand and gravel production for Kent and East Sussex.

The South Eastern Railway Company built a line to Dungeness in 1883, presumably so that it could transport ballast for use along the line and elsewhere. This appears to be the first commercial exploitation of the gravel from Dungeness. A sizeable area of shingle was subject to digging, but it seems that the first block of open water was not created until the 1920s, when it is thought the Long Pits excavation commenced. On a small scale aerial photographic mosaic in Lewis (1932) the Open Pits can be easily recognized, but the only other suggestion of open water appears to be part of the Long Pits. From this relatively small beginning, gravel extraction has expanded at a considerable rate reaching a peak in 1973 when production was 1.5 million tonnes. Since 1974 (Kent County Council, 1982) production has hovered around or just below the 1 million tonnes per year mark. Using K.C.C.'s Planning Department records, Henderson (1983) and Southern Water Authority et al. (1984), it is possible to build up a chronology of extraction (Table 1). These figures should only be taken as a guide to the acreage and age of developments. Southern Water Authority et al. (1984) record the growth in open water from 61 ha (151 acres) in 1961 to 141 ha (348 acres) in 1981.

Table 1. Details of the major artificial water areas in the Denge region.

Water area	Approximate date of excavation	Approximate area of open water to be created (ha)	(acres)
Long Pits (1)	c.1920	6	15
Old ARC/Watertower Pits (2)	1920s and 1930s	5	13
Hamilton Farm Pits (Hookers Pits) (3)	1950s and 1960s	19	46
ARC Pit (Railtrack Pit) (4)	Late 1950s and late 1960s	42	104
Lade Pit (New Romney Pit) (5)	1940s onwards (reserves)	35	87
Burrowes Pit (6)	1970s	46	115
Brett's Pit (Lydd Watersports Centre) (7)	1948 onwards (current)	27	68
New Diggings (8)	1970s and 1980s	28	89

(Lydd-on-Sea Pit and Amey Roadstone Company's pit west of Burrowes Pit are not included in the above figures because their current permissions restrict or are likely to restrict any extraction below the water table.)

(See Figure 2 for location of pits.)

Their hydrogeological study calculates that 10% of Denge Beach is open water (70% is bare shingle and 20% has vegetation). Further areas are consented for gravel extraction e.g. Lydd-on-Sea pit, and an area west of Burrowes Pit, but both these have restrictions on working below the water table at present. Similarly, there are substantial areas where gravel has been extracted above the water table, for example around the Long Pits.

Although there has been considerable loss of shingle areas to mineral working, it is salutary to note that over 300 ha (750 acres) of application have been refused permission at one time or another, and approximately 120 ha (295 acres) have only been granted on appeal to the Secretary of State.

Measurement of existing open water areas and areas likely to become open water (Figure 2) on the Proposals Map accompanying the Dungeness Countryside Plan (Kent County Council Planning Department, 1982) indicate that 208 ha (527 acres) within the Dungeness Site of Specific Scientific interest may become open water. The effect of gravel extraction extends beyond the final lake boundaries because of working, washing and storage areas. The total area of land covered by gravel winning applications up to 1976 is 726 ha (1793 acres): this includes some double counting because certain sites have been subject to more than one application. But this is not the end point for gravel application as The Dungeness Countryside Plan states "local planning authorities consider that Dungeness should continue to play an important rôle in meeting Kent's need for sand and gravel".

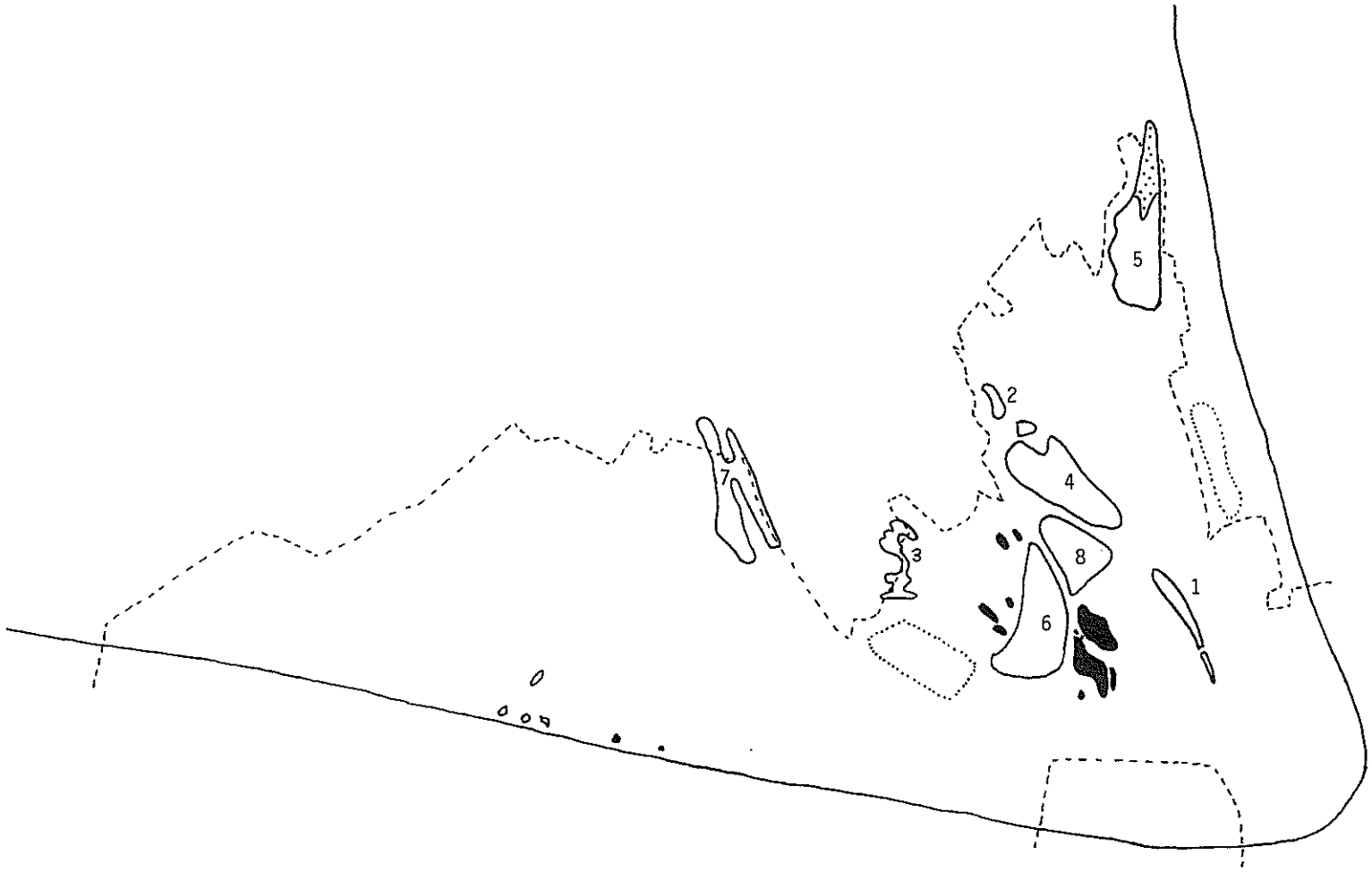
The D.O.E. circular 56/78 following the Verney Report (Anon., 1976) envisages that land will be required for aggregate extraction for the next 10-15 years before marine sources or other alternatives are widely available. There can be few new areas at Dungeness however where there would not be major constraint from nature conservation, public water supply or military training. The construction of a Channel link, with its major demand for gravel (and requirement for dumping spoil) may be seen as over-riding all these factors.

Water Abstraction

The brick water tower at Littlestone first supplied water to the public from the shingle aquifer at the end of the nineteenth century. Development of additional wells and abstraction rates have increased substantially since World War II. Southern Water Authority et al. (1984) record an increase in abstraction from 614 megalitres per year in 1950 to 2362 megalitres per year in 1982. Figure 3 shows the location of Folkestone and District Water Company's wells and water mains in 1982, and indicates the extensive nature of their operations at Dungeness. Several of the wells have been abandoned or are no longer in current use, but replacement wells or additional ones are being, or may be, constructed in due course.

I understand the Water Company prizes the Dungeness aquifer because little treatment is required to reach potable standards - the only treatment used is chlorination. The Water Company however faces an increasing demand for water, yet has virtually no new untapped resources within its operating area. The company hold two licences for water abstraction at Dungeness which total 4978 megalitres per year, more than double the existing rates of abstraction.

FIGURE 2 OPEN WATER



Natural pits

Permitted areas for gravel extraction

Permitted areas with restrictions on working below the water table

SSSI boundary

PITS

1 Long Pits
2 Old ARC/Watertower Pits
3 Hamilton Farm Pits
4 ARC Pit
5 Lade Pit
6 Burrowes Pit
7 Brett's Pit
8 New diggings

1 Km

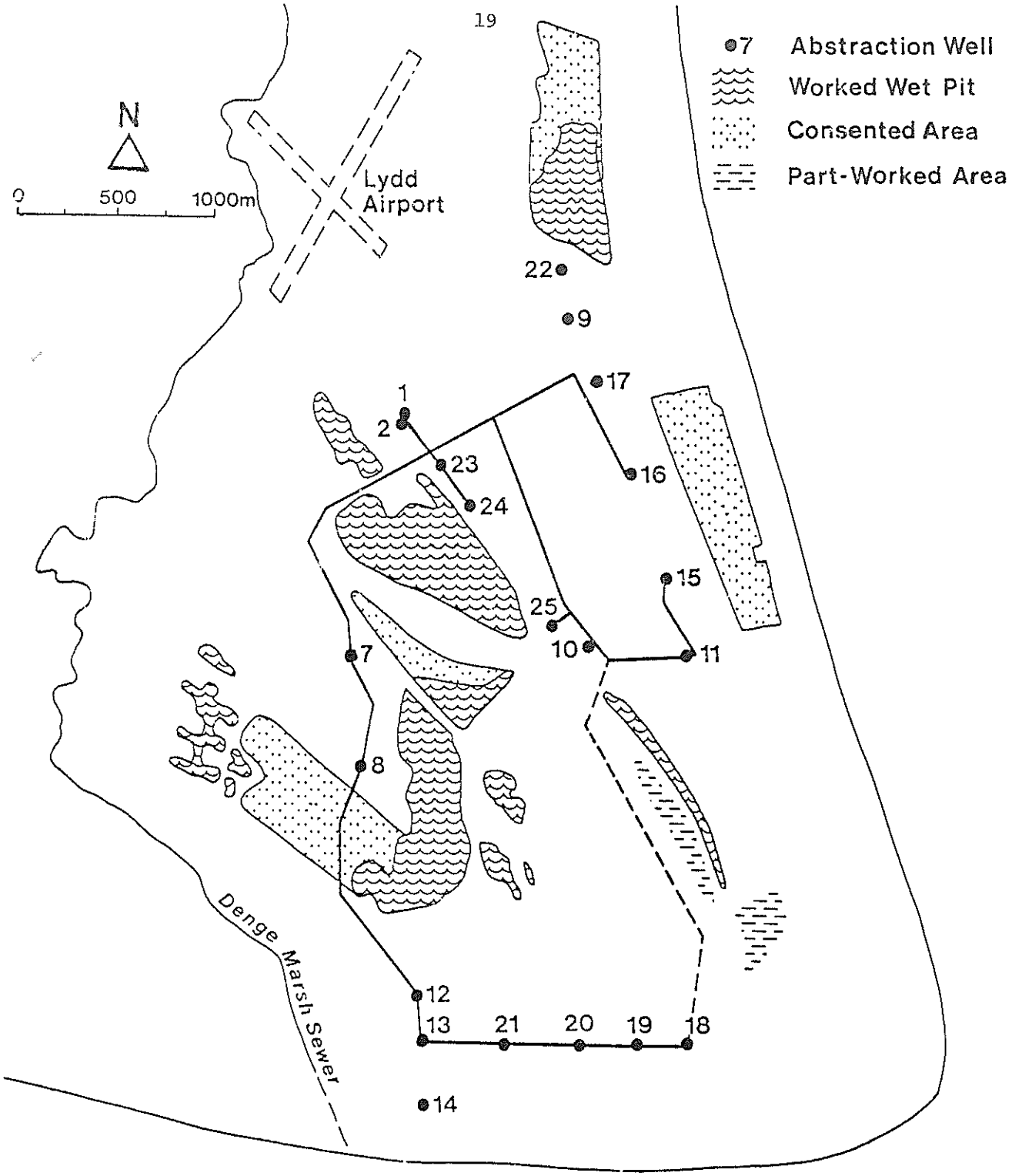


FIGURE 3 LOCATION OF THE WATER BOARD WELLS MAINS AND GRAVEL PITS
(with permission of Folkestone and District Water Company)

Southern Water Authority et al. (1984) have made careful analysis of abstraction records, water table levels, salinity levels, natural losses to the aquifer (such as the Denge Marsh sewer) and aquifer recharge, etc to allow a calculation of a water balance. The model used to estimate recharge suggests that bare shingle has twice the mean recharge of vegetated shingle and over five times the rate of open water. Clearly, gravel extraction below the water table results in a considerable effect on the level of the water table and hence ground water storage.

The study shows that while individual wells have had widely fluctuating water levels, there were generally steady or slightly falling levels in the 1960s, followed by a more appreciable decline in the early 1970s when total ground water abstraction increased by 30%. By constructing a mathematical model and completing a series of runs when different factors were varied, the study has attempted to assess the relative importance of increasing abstraction rates and increasing area of open water on ground water levels. The conclusion is that both variables have contributed to the fall in water levels. The modelling of mean ground water suggests a decline of 0.26 metre over the 20 year period 1961-1980; 0.18 m (69%) is attributed to increased public water supply abstraction and 0.08 m (31%) due to increased evaporative loss from water filled gravel pits.

Associated with this decline in water levels and hence volume of water storage, has been a rise in the salinity levels of the aquifer. While tidal flow up the Denge Marsh sewer causes local contamination of the aquifer and there is a narrow zone of salinity on the south coast, the highest levels and most significant area affected is the east coast. Here a zone of saline incursion increases from 100 m at the Ness up to approximately 400 m at the northern part of Denge Beach. Saline intrusion appears to be confined to the winter months as the critical level of tide is not reached in the summer months, and is considered to threaten only 2.5 km of coastline between the Long Pits and Lade Pit. Currently, the critical tide level of 4.5 metres O.D. is, on average, exceeded one and a half times per year. Lowering of ground water levels has accelerated the rate of saline intrusion from an average 1-in-6 year event 20 years ago to a 1-in-4 year event 10 years ago to the current 1.5 events per year. Any further lowering of the water levels by 0.1 metres or 0.2 metres would increase the occurrence of intrusion to 3 and 5 times per year respectively.

Mathematical modelling in the Denge Hydrogeological Study (Southern Water Authority et al., 1984) suggests however that by judicious manipulation of abstraction rates between the wells (together with new wells) and restricting gravel extraction to areas away from the critical east coast, it is theoretically possible that both an increase in water abstraction and further gravel extraction could be compatible with maintaining the coastal ridge of freshwater in winter at its current level, and thus the current rate of saline incursion.*

* At the time of the study (Southern Water Authority et al., 1984) it was considered that the major area affected by saline incursion was a section of the eastern coastline. However, as a consequence of a major tidal surge in November 1984 it has been demonstrated that the southern coast in the vicinity of Denge Marsh sewer and inland parts of the aquifer adjacent to the sewer are also at risk from saline incursion. This may require some local modification of the source-switching strategy indicated by the model, if preventative measures cannot be implemented to protect the aquifer.

One of the direct effects of the Water Company's activities has been the series of tracks which cross the shingle to the network of wells; each new or trial well will necessitate some further irreparable damage to the shingle. The effects of a falling water on various plant communities such as the holly wood at Holmstone, the vigour of blackthorn bushes, and the loss of various plants from wetland areas, e.g. the Open Pits (Ferry & Henderson, 1984), are more difficult to quantify.

The increasing demand for water could have resulted in a significant change to Dungeness in the early 1970s, when the Water Company considered developing four storage reservoirs on their land. The reservoirs would have covered 200 ha (500 acres) of shingle with an estimated capacity of 15 436 megalitres (3400 million gallons). The proposal envisaged creating a 30 foot shingle perimeter bank around each reservoir above ground level, with the base of the reservoirs being 10 feet below ground level; the shingle would have been lined with butyl rubber. Besides alleviating their problems, the Water Company considered that one of the scheme's advantages would be to make available "a very large quantity of shingle". There was also a suggestion that the reservoir walls could be constructed from Channel Tunnel chalk rubble. A feasibility study showed that the benefits did not outweigh the costs.

Electricity Generation

Following the 1958 Public Inquiry, the Central Electricity Generating Board established their 108 ha (266 acres) compound at the southern tip of the Ness on a core area of the shingle formation (Anon, 1958). In 1974 Dungeness was identified as one of four possible sites for future nuclear power generation when a 'C' station was first proposed in addition to the two existing stations. The current situation is that the next nuclear power station in C.E.G.B.'s programme after Sizewell 'B' (recent Public Inquiry) will be Hinkley Point 'C'. The site to follow Hinckley will be selected from Dungeness 'C', Druridge Bay, Sizewell 'C' and Winfrith. This does not mean that only one of these four sites will be developed, and all of them may be built in time. C.E.G.B. have undertaken a wide range of studies as part of their Dungeness 'C' investigations.

Location of the power stations on an eroding shore (Hubbard 1970) has generated a considerable and continuing demand for sea defence works in the form of a beach feeding scheme. Currently the beach feeding scheme involves moving between 25 000 and 35 000 cubic metres of shingle each year from the east side of the Ness to the west.* The storms of November 1984 made a considerable impact on this southern coast and J. Eddison estimates (pers. comm.) that the top of the sea bank at South Brooks moved inland by the order of 30-40 feet.

* In addition to C.E.G.B.'s requirements, Southern Water Authority extract approximately 30 000 cubic metres per year for their sea defence work. It is anticipated that S.W.A.'s beach feeding at Denge will require a higher level of input than it has received in recent years. Initially Kent Rivers Authority extracted shingle from a block of Holmstone Beach to meet this demand. Peterken and Hubbard (1972) estimated that this would result in the direct loss of 35% of the holly bushes surviving in 1962.

An additional power station is likely to require land outside the present compound, possibly in the order of 30 ha (74 acres). There is some question as to whether C.E.G.B. ever gave an undertaking that no further land outside the compound would be taken. Besides this direct loss of additional land for storage areas and possibly a work camp, one can speculate that there may also be a need for further permanent services such as additional cooling water, road access and overhead lines, besides temporary requirements for berths to receive material transported by boat. Any disturbances to the shingle is in effect 'permanent'; and even a simple routine task of maintenance to overhead cables can result in significant damage to the shingle ridge formation and vegetation.

Additional nuclear power generation capacity poses a serious threat to one of the key areas of relatively undisturbed shingle, the land surrounding the present compound.

Other pressures

Inspection of K.C.C. Planning Records reveals that there are few areas which have escaped the attention of developers over the years. Proposals have included 240 acres for caravans and camping by Lydd-on-Sea railway station in 1955, 140 acres of housing adjoining this railway station in 1958, and 1100 caravans south of the airfield in 1981, to name just a few of the leisure developments. Although these sound like substantial threats, Maunsell and Partners' proposal for Port Dungeness in 1971 was of extensive proportions. A press cutting reports their plans to reclaim 6800 acres of land from the sea with a 7 mile lagoon from the Ness to Hythe and using 3200 acres of shingle. Suggestions for a deep seaport apparently date back to the 1920s.

The location of Dungeness dictates that it will always receive attention when the topical subject of cross channel links is discussed. Regardless of the constraints discussed above, the substantial reserves of aggregate together with the enormous volumes of spoil generated by a tunnel must make Dungeness a favoured location for some part of this development.

The intensity of recreational pressures and their overall effect on the flora and fauna is difficult to quantify. Certainly, Camber Sands and Rye to the west, and the coast from the Romney Sands Holiday Village northwards attract substantial numbers of visitors. However, the thousands of sightseers disgorged by the small gauge railway at Dungeness probably cause relatively little harm, whilst errant motor cyclists, dune buggies and three-wheeled all-terrain-vehicles do cause significant damage.

THE FUTURE

The vast majority of the pressures on Dungeness lie outside the scope of the Wildlife and Countryside Act 1981 because they are planning issues where the District and County Council or indeed Central Government will be the final arbiters. Obliged as they are to consult N.C.C. and 'take into account' N.C.C.'s representations, planning decisions are made by elected representatives who may have a less than perfect understanding of the issues and international importance of Dungeness for nature conservation.

The forthcoming review of the Dungeness Countryside Plan therefore provides an important opportunity for conservation bodies to ensure that K.C.C.'s framework for considering proposals for the next ten years or so do take adequate account of nature conservation. It will be interesting, indeed inspirational, if the planners can reconcile the needs of conservation with the requirements of providing aggregates, protecting water supply and sea defences, reducing despoilation of the landscape and accepting the expansion of military training.

ACKNOWLEDGEMENTS

The history and development of human pressures on Dungeness is complicated. Whilst the errors must remain my responsibility, I am grateful for all those who have provided me with information: Col. West of the Cinque Ports Training Area, Mr Mike Parsons of K.C.C. Planning Department, Dr John Hubbard, and Mrs Liz Amos of N.C.C.

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DISCUSSION

LAUNDON
I believe it is your plan to establish a National Nature Reserve at Dungeness eventually, so it is said. What is happening about that, please?

FINDON
The Nature Conservancy, as it was in 1958, at the Public Inquiry said, in effect, that if a nuclear power station was built, there would be no point in having a National Nature Reserve. Since then, there have been discussions from time to time on having a National Nature Reserve, perhaps by having a nature reserve agreement with the R.S.P.B. on their land. I am certainly of the opinion, and I think my colleagues within the region are as well, that we do need to try to establish a National Nature Reserve at Dungeness now. It seems to me that the only way we can effectively conserve Dungeness is through Nature Conservancy Council ownership of the land. At present, decisions are made by local planning authorities and not by ourselves, and I think it is very important that we should try and have a direct involvement ourselves.