MINORA
RESOURCES NL

OIL EXPLORATION PERMIT EP 325
EXMOUTH GULF
WESTERN AUSTRALIA

COOPER No. 1
NOTICE OF INTENT

VOLUME 2 — APPENDICES

Prepared by LeProvost, Semeniuk & Chalmer

Minora Resources NL

MINORA RESOURCES NL

EXPLORATION PERMIT 325

PUBLIC ENVIRONMENTAL REPORT

Volume 2

APPENDICES

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Note: Appendix 2: Prediction of Oil Spill Envelopes for the Proposed Whalebone Prospect and Rivoli Prospect Exploration Wells, Exmouth Gulf, by Steedman Limited, is bound under separate cover as Volume 3

These appendices were originally prepared for Rivoli-1 and Whalebone-1 locations. As Rivoli-1 is in a similar location to Cooper-1 they have been reproduced for the Cooper-1 NOI

APPENDIX 1

APPENDIX 1

ENVIRONMENTAL PROTECTION AUTHORITY GUIDELINES

ENVIRONMENTAL PROTECTION AUTHORITY
1 MOUNT STREET, PERTH, WESTERN AUSTRALIA 6000
Telephone (09) 222 7000

CC RJL

→ EP 325 - G01

7/2

General Manager
Minora Resources NL
7th Floor, Colonial Mutual Building
55 St Georges Terrace
PERTH WA 6000

Your Ref:
Our Ref: 155/74
Enquiries: Mr M Waite

Attention: Mr P Lawry

Dear Sir

APPLICATION TO DRILL COOPER NO 1 WELL WITHIN EXPLORATION PERMIT EP325 - EXMOUTH GULF

I refer to my letter of 25 January 1989 with respect to the Environmental Protection Authority's decision to formally assess the above proposal under Part IV of the Environmental Protection Act, 1986.

The Authority has subsequently set the level of assessment at Notice of Intent (NOI). Please find attached guidelines to assist in the preparation of the NOI.

Should you require further information on this matter, please contact Mr Michael Waite on 222 7085.

Yours faithfully

R A D Sippe
A/DIRECTOR
EVALUATION DIVISION

1 February 1989

032MWMR:jm

Att

CC: Director General Of Mines
Department of Mines
Petroleum Division
Attention: Mr Gouldie

EXPLORATION PERMIT 325 - MINORA RESOURCES NL
EPA GUIDELINES FOR PUBLIC ENVIRONMENTAL REPORT (PER)

SUMMARY

This section should contain a clear and concise summary of the salient features of the proposal, existing environment, the magnitude and extent of environmental impacts and environmental safeguards and management.

1. INTRODUCTION

This section should include:

. background and objectives of the proposal;

. details of the proponent;

. why the document has been prepared;

. scope and timing of the proposal;

. previous exploration programmes in the area; and

. relevant legislative requirements and approval processes (State and Commonwealth).

2. NEED FOR PROPOSAL

This section presents an opportunity for the proponent to describe in a general way the broad costs and benefits of the project to the Company and community. These should be described at local and State levels.

3. THE PROPOSAL

The document should provide descriptions of various components of the proposal, concerning all operational aspects as well as abandonment of prospects following drilling. Matters to discuss would include:

. location and timing;

. relation to Environmentally Sensitive Locality;

. relation to Ningaloo Marine Park;

. type of drilling rig;

. shore based and marine support facilities;

. need for exclusion zones; and

. alternative to preferred drilling sites.

4. EXISTING ENVIRONMENT AND ITS RESOURCES

The environment to be described should include areas directly influenced by the drilling programme as well as those that could be influenced by oil spills. Only information that will be relevant when considering the environmental effects of the project should be included.

The habitats and significant environmental resources which may be influenced by the project should be defined.

The physical and biological processes that are the major determinants of the survival of the habitats and resources should be identified. An assessment of the resilience of these habitats and resources to natural pressures such as cyclones and predation would provide a basis against which the proponent's potential impacts could be predicted.

Key features of the environment that would need to be safeguarded during the project should be summarised (eg bird nesting sites, turtle nesting beaches and coral reefs islands, dugong feeding areas, prawn nursery areas).

The following aspects of the existing environment should also be addressed in this section:

(a) currents : flow rates and directions (will be critically important for any spill control and for intended waste disposal);

(b) wind : speed/direction. On each component, pre-operational data is needed as well as monitoring whilst operational;

(c) turbidity : this needs to be quantified at Bundegi reef at the site(s) and in between (depending on currents);

(d) commercial environment : ie prawn fishery and charter/tourist industry; and

(e) human environment - ie recreational use of coast, reefs and near-shore environments for recreation.

5. ENVIRONMENTAL IMPACTS

This section should provide an assessment of the potential effects of the project on the habitats and resources of the study areas and should consider in particular the effects on ecologically significant features of the environment. Critical parts of ecosystems which would need to be managed should be identified.

The effects should be considered in the context of the natural pressures acting on the habitats and resources and an assessment made of whether potential effects of the project will significantly add to the existing pressures.

Where it is necessary to qualify the assessment of uncertainty or limited data, this should be clearly stated.

The type of oil likely to be encountered should be detailed along with a rationale for the decision.

Particular attention should be paid to any effects of waste water discharge as well as the effect of oil spills.

In the case of oil spills a risk analysis should be undertaken that covers the following topics:

- the probability of an oil spill:

  (i) due to fuel handling mishaps or temporary failure of blow out preventors;

  (ii) a blow out with a consequent partially controlled oil loss; or

  (iii) an uncontrolled blow out.

- the probabilities of oil from these accidents impinging on important habitats or resources that bound the proposed exploration area. Use of oil spill trajectory analyses would be appropriate; and

- the effects that these spills could have on these important habitats or resources. This consideration should utilise knowledge of the oils likely to be involved including chemical and physical effects after various degrees of weathering.

The complete context of discharges and potential impacts should be considered ie "domestic" wastes and "industrial wastes", and proposals to ameliorate or negate such impacts.

Particular attention should be paid to the disposal of drill cuttings and drilling muds.

Procedures for the containment and treatment of spill should be clearly set out and use of dispersants should be avoided and used only when a pre-defined need is determined, and the protocol for approval and the type of dispersant to be used. (In most cases it would be best not to use dispersants.) The type of dispersant should be specified.

A commitment should be made to pressure test each new string of well casing, before use.

Oil and gas fires should be addressed.

Helicopter operations should be addressed.

To conclude this section an overview or synthesis should be given to show how the proposal will interact with the total ecosystem. This synthesis should also include an assessment of the significance of the various impacts identified.

6. ENVIRONMENTAL MANAGEMENT

An environmental management programme should be described on the basis of the synthesis of environmental impacts previously outlined. This section should describe the objectives and scope of the programme with as much as much detail as possible. The objectives, the scope and details of the programme should be described. Assignment of responsibility for environmental management structure should also be stated and commitments given.

It will be essential to discuss the proposed management programme in relation to current practice elsewhere in WA and Australia for various aspects of the proposal.

Emphasis should be given as to how the environmental management programme will be adapted in response to results from the monitoring programme.

Environmental management should include ecosystem management and should specifically include measures for the protection of turtles, dugong, birds, mangroves and coral.

In addition, measures for the protection of local prawn, pearly oyster and fishing interests should include proposals for adequate compensation, should unforeseen damage result from the proposal.

The procedures for reporting results of monitoring and environmental management to the appropriate authorities should be provided. Also summarise and, where necessary, detail management commitments described in this and earlier sections.

7. OIL SPILL CONTINGENCY PLAN

Should include the capability to contain oil spillages of up to 20 m^3 on or adjacent to the rig. A suitable boom and skimmer device, together with an operator skilled in their deployment, should be permanently stationed on the rig prior to the commencement of drilling.

8. CONCLUSIONS

Conclusions on the overall effects of the proposal should be presented together with any qualifications regarding the conclusions reached.

9. ENVIRONMENTAL MANAGEMENT COMMITMENTS

APPENDIX 3

APPENDIX 3

COST ESTIMATE FOR

COLLECTION OF CUTTINGS FROM THE WELL BORE

FOR DISPOSAL OFFSITE

Assuming that a standard gauge hole is drilled, theoretical cutting volumes returned for each hole would be as follows:

Hole Size	Length	Volume of Dry Cuttings m^3	Approximate Volume of Fluid m^3	Total Volume m^3	Weight of Cuttings and Liquid Tonnes	Number of 4 m^3 Skips	Days to Drill	Comments
36"	43 m	Nil	Nil	Nil	Nil	Nil	1	Returns to seabed
26"	408 m	140	70	210	350	52.5	1.5	Contingent hole size
17.5"	1,108 m	172	86	258	430	64.5	4.5	Most likely hole size
12.25"	730 m	55	17	72	127	18	5.5	
8.5"	70 m	3	1	4	7	1	1	

The intention would be to load full skips onto work boats, which would steam to a dumping ground approximately 20 km north and discharge the cuttings. So as to allow for handling, 4 m^3 skips would be used.

During the 26 inch hole (should it be necessary to drill this section) it would be necessary to turn around at least 26 skips in 1.5 days. This would be impossible due to the constraints in handling the skips on the work boat and storage on the rig. Estimated maximum number of skips that a boat could carry and handle would be 19, turnaround time would be approximately 11.5 hours (depart rig to return to rig). Therefore would require approximately 38 skips allocated to the rig plus a crane and workboat dedicated to the task during a time when the utilisation of this equipment for other vital tasks would be at a premium. The 26 inch hole is a phase which has to be drilled with the utmost efficiency and speed, since the lack of hole stability with time in this section could seriously jeopardise the chances of successfully drilling the section.

In the smaller hole sections it would be possible to remove cuttings from the rig providing there was available approximately 30 skips, a work boat and an allocated crane driver.

The above assumes that it is possible to modify the present surface mud system on the rig by installing conveyers to transport the cuttings to the skips and that the solids control equipment can be set up to deliver virtually dry solids to the conveyor. To install an efficient system would require modifications to the rig, which would result in considerable expense for a one well programme. (The rig would have to be returned to its original state once the well was completed.)

The above deals with solids removed by solids control equipment. Solids are also collected in settling tanks (sandtraps) which have to be discharged regularly, approximately every two days. Volume involved is 29 m^3. This would have to be transferred into transportable covered tanks for discharge from the work boat.

If the above systems were set in place, there is a risk that the drilling operation could be shut down due to inclement weather prohibiting the transfer of full or empty skips/tanks between the rig and work boat.

Should drilling have to cease due to lack of empty skips, it would be preferable to circulate on bottom so as to maintain hole condition. This may not be possible due to the caving of the well bore in the shaley sections. These cavings would have to be removed at surface and collected in skips also. Without any empty skips, circulation would have to cease, thereby putting the successful drilling of the well at risk.

COST OF REMOVING CUTTINGS FROM THE RIG

This estimate assumes that a 26" hole is not drilled, since it would be impossible to cope with the amount of cuttings generated from a hole of that size.

SKIP LOADS

For each hole size the number of 4 m^3 skips loads required would be:

Hole Size	Skip Loads
17 ½" OH	64.5
12 ¼" OH	18
8 ½" OH	1

Assuming gauge hole, and that all cuttings are circulated out and removed at surface.

FUEL REQUIRED

Disposal of these cuttings would require six round trips of approximately 20 km taking two hours per trip.

= 562 L/hour x 12 hours
= 6,744 L @ $0.30/L
= $2,023.00

TOTAL $2,000.00

RENTAL ON SKIPS

Say 30 skips for four weeks at $5.00 per day per skip.

= $4,200.00

TOTAL $4,200.00

PERSONNEL

Dedicated crane driver and roustabout for three weeks.

= $9,600.00

Solids control engineer at US$450.00 per day for three weeks.

= $12,600.00

TOTAL $22,200.00

EQUIPMENT

Explosion proof conveyor system for six weeks at +/-$200.00 per day.

= $8,400.00

Centrifuge for four weeks at +/-$250.00 per day

= $7,000.00

Mud Cleaner for four weeks at +/-$150.00 per day

= $4,200.00

TOTAL $19,600.00

INSTALLATION

Modification of rig	$10,000.00 est
Installation of conveyor	$ 2,000.00 est

TOTAL $12,000.00

REMOVAL OF SAND TRAP VOLUME

Two Mono-pumps at $150.00 per day per pump for four weeks.

= $8,400.00

TOTAL	$8,400.00
TOTAL COST OF OPERATION	$68,400.00

Likely to lose two days rig time due to inclement weather, i.e.:

- one day shut down due to skip shortage;
- one day conditioning hole to allow drilling to recommence, if possible.

DAILY OPERATING COSTS

= $115,000.00	$230,000.00
REAL COST OF CUTTING REMOVAL	$298,400.00

APPENDIX 4

APPENDIX 4

EXAMPLE HANDOUT FOR ALL RIG PERSONNEL AND VISITORS

ENVIRONMENTAL PROTECTION

1 GENERAL

It is Minora's responsibility to minimise the short term effects of our drilling operations on the environment and to avoid any long-term effects. All personnel on site must practise good house-keeping and enforce the following rules and practices.

2 OIL SPILL PROCEDURES

Refer to the "Oil Spill Contingency Plan".

3 ENVIRONMENTAL PROTECTION PROCEDURES

The whole of the permit is environmentally sensitive. Because the wells are located close to coral reefs and in a major known fishery and tourist area, Minora requires adherence to the following procedures.

3.1 ALL PERSONNEL

3.1.1 Observe good housekeeping practices, do not allow any materials to be washed or dumped into the sea. If any accidental dumping occurs, report it to the Rig Supervisor, the Maersk toolpusher or Barge Engineer, or your Supervisor immediately.

3.1.2 Fishing will be totally banned during all wells. The reasons include the hazards to divers caused by lost lines and tackle; attraction of sharks to the rig resulting in the potential for divers or personnel abandoning the rig being attacked; selective depletion of the larger carnivorous fish with detrimental effects on the ecological balance and other valid reasons.

3.2 DRILLING FLUIDS ENGINEER, DERRICKMAN, SHAKER HAND

3.2.1 Do not use restricted chemicals as listed in the individual wells drilling fluid's programme unless approved by the Drilling Supervisor.

The drilling fluids formulations in the enclosed drilling fluids programmes are not environmentally damaging under normal operating conditions. Do not use any materials (except inert ones) in excess of the recommended concentrations, or any materials not included in the programme, unless such use is approved by Perth Office.

3.2.2 Ensure that the shakers and desander/desilter/mud cleaner are operating efficiently so minimal drilling fluids go overboard with the cuttings/solids. Use the mud cleaner in preference to the desander/desilter. Do not discharge drilling fluids into the sea without the approval of the Drilling Superintendent. Any discharge shall be at a minimal rate during favourable combinations of spring ebb tide and wind direction.

3.2.3 Drilling/completion fluids remaining on board the rig towards the end of the well **must not be discharged** unless they pose a safety problem.

In the event of production testing and/or suspension of the well, plan ahead to either:

(a) minimise both drilling fluids and brine quantities and keep both on board if possible, or

(b) discharge the drilling fluids at a slow, controlled rate, according to the tidal flow's capacity for diffusion as directed by the Drilling Superintendent.

3.2.4 If the generation of toxic, oily or generally non-biodegradable wastes cannot be avoided, these should be removed by the supply vessels for shore disposal. Disposal requirements will be determined by Perth Office in conjunction with the Health Department of Western Australia.

3.3 MAERSK BARGE ENGINEER/TOOLPUSHER

3.3.1 Note comments under 3.2 above.

3.3.2 Do not dose the sea water cooling system with micro biocide.

3.3.3 Collect all waste oil, kitchen oil and other noxious and toxic materials in drums for shipment to Port Hedland.

3.3.4 Normal rubbish may be burnt over the side, provided that:

(a) a hot work permit is obtained from the Drilling Representative and Maersk Toolpusher;

(b) it is contained within a basket so non-degradable material is recovered;

(c) all material remaining after burning is shipped to Port Hedland for disposal.

3.3.5 Ship all non-burnable rubbish (batteries, etc.) to Port Hedland.

3.3.6 Treat all sewage and liquid kitchen wastes prior to discharge into the sea. Use only biodegradable products in the kitchen and sewage systems (e.g. detergents).

3.4 SUPPLY VESSEL CAPTAINS/HELICOPTER PILOTS

3.4.1 Maintain a constant watch for fishing activity to prevent fouling of gear and damage to the fishing industry. Helicopter reports should be passed to the vessels so that they may avoid such activity areas.

3.4.2 Helicopters shall avoid overflying islands, thus avoiding disturbance of seabird colonies.

3.4.3 No island landings of vessel or helicopter crews shall be permitted without prior written approval from the Drilling Superintendent.

3.4.4 No wreck diving by vessel crews shall be permitted.

3.4.5 Keep as full a log as possible of observed current directions and other observations that may help us understand tidal/current behaviour. (Note the limitations on drilling fluid discharges in Section 3.2 above.)

3.5 DIVERS, ROV

Following abandonment or suspension of any well, a diver or ROV inspection shall be made to carry out the following:

(a) ensure no obstructions remain on the seabed;

(b) make a map of the dispersal of drill cuttings;

(c) measure and photograph the suspended well, especially noting the height above seabed of a reference point on the well.

APPENDIX 5

APPENDIX 5

MINORA RESOURCES NL

OIL SPILL CONTINGENCY PLAN

FOR EXPLORATION DRILLING PROGRAMME

WITHIN EXPLORATION PERMIT 325

CARNARVON BASIN

Report to : Minora Resources NL,
7th Floor, Colonial Mutual Building,
55 St George's Terrace,
PERTH WA 6000.

by : LeProvost, Semeniuk & Chalmer,
Environmental Consultants,
181 York Street,
SUBIACO WA 6008.

29 July 1988.

LSC Ref: J156

Report No. R227

MINORA RESOURCES NL

OIL SPILL CONTINGENCY PLAN

FOR EXPLORATION DRILLING PROGRAMME

WITHIN EXPLORATION PERMIT 325

CARNARVON BASIN

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MINORA RESOURCES NL

OIL SPILL CONTINGENCY PLAN

FOR EXPLORATION DRILLING PROGRAMME

WITHIN EXPLORATION PERMIT 325

CARNARVON BASIN

1 INTRODUCTION

1.1 BACKGROUND

Minora Resources NL propose to drill two exploration wells offshore in Exmouth Gulf during the period 15 November 1988 to 28 February 1989. These wells are known as the Rivoli and Whalebone Prospects.

Exmouth Gulf is identified in Department of Conservation and Environment (DCE) Bulletin 104 (1984) as an Environmentally Sensitive Locality (ESL). The two wells in fact occur in two adjoining ESL's as follows:

- Rivoli Prospect: Exmouth Gulf (ESL 33) is an area which is considered to have international, national and state ecological significance, high economic importance as a commercial fishery and prawn nursery, and high recreation utilisation as a tourist and sport fishing area;

- Whalebone Prospect: Ningaloo Marine Park (ESL 34) is an area which is considered to have high international, national and state ecological significance, high economic importance, high recreation utilisation as a major tourist destination, and high scientific research and educational values.

The Environmental Protection Authority (EPA) has requested Minora to prepare a Public Environmental Report (PER) for the proposed exploration programme because of the environmental sensitivity of the marine resources in the area to oil spill. As part of the PER, Minora were asked to produce an oil spill contingency plan for implementation in the unlikely event of an oil spill occurring during the drilling programme.

1.2 THIS DOCUMENT

This document outlines the oil spill contingency plan for the proposed exploration drilling programme.

The purpose of the document is to provide action guidelines for implementation by both on-site and Perth-based personnel in the unlikely event of an oil spill occurring during the programme. As such the document contains information on:

- objectives of the plan;
- priority actions in the event of a spill;
- location of marine resources in the region;
- oil spill trajectory predictions for various wind and tide conditions;
- notification and communication priorities;
- oil spill containment and dispersal guidelines;
- location of oil spill containment and dispersal equipment;
- oil spill clean-up guidelines;
- environmental monitoring guidelines.

1.3 OBJECTIVES

The objective of the plan is to prevent damage to the sensitive nearshore and shoreline marine resources of the area by implementing appropriate oil spill containment, collection, treatment and clean-up methods.

1.4 PRIORITY ACTIONS

In the event that an oil spill should occur either due to the drilling operation or from attendant vessels, the following priorities will be observed:

- Priority 1: personnel safety;
- Priority 2: fire prevention;
- Priority 3: cut off the source of oil;
- Priority 4: notify company and government personnel of relevant information regarding spill;
- Priority 5: implement actions aimed at prevention of a slick from reaching shore or sensitive habitats;
- Priority 6: prepare report;
- Priority 7: initiate environmental monitoring.

This document provides guidelines and information for use for Priorities 4-7. Guidelines for Priority 1-3 are contained in the rig operator's emergency procedures manual.

Detail on Priorities 4-7 is presented below.

2 NOTIFICATIONS AND COMMUNICATIONS

2.1 ON-SITE OIL SPILL REPORTING PROCEDURES

Any company or contract **employee** observing an oil slick will immediately notify his supervisor or, in his absence, the rig Drilling Supervisor.

The Drilling Supervisor will confirm the observation, its possible cause and extent. The Supervisor and/or employee will then take any action possible to stop the flow of oil and will shut off any engines or electrical equipment that may create a fire hazard.

The **Drilling Supervisor** will alert the marine personnel, aircraft personnel, and organise the equipment necessary to combat the oil spill. He will ensure that all necessary action is taken and will confirm that the oil spill has been dispersed.

The **Drilling Supervisor** will be responsible for notifying Head Office in the event of an escape of hydrocarbon in excess of 0.5 barrels (0.08 m^3) resulting from the operator's activities.

2.2 HEAD OFFICE REPORTING PROCEDURES

Head office (**Drilling Manager**) will be responsible for determining whether or not spill control is within the company's capacity to achieve or whether outside assistance is required. Notification of Government departments will only be activated when a significant oil spill takes place (25 barrels, 4 m^3). The Environmental Advisor will also be alerted and put on standby to travel to the site.

Responsibilities for handling an oil spill within the company's handling capabilities are summarised in the Phase 1 action chart (Table 1). If control of an oil spill is beyond the capabilities of the company's resources, then a request will be made to the Oil Industry Marine Oil Spill Action Plan (MOSAP) to be called into action through the Regional Industry Controller at Dampier. This plan was prepared by the Petroleum Institute Environment Conservation Executive (PIECE), and co-ordinates oil industry spill control facilities (Phase 2 action chart) (Table 2).

In the unlikely event that spill control is beyond the resources of both the company and MOSAP, assistance will be requested of the National Plan to Combat Pollution of the Sea by Oil (NP).

3 ACTION STEPS FOR HANDLING OIL SPILL

Detailed action steps for handling oil spills of various sizes are provided below for each of the categories of spill discussed in Section 2.2.

3.1 PHASE 1 - SPILL CONTROL WITHIN COMPANY CAPACITY

- Safety of personnel and prevention of fire are the only matters taking precedence over oil spill control.

- Identify fire risk and take action to control the escape of hydrocarbons.

- Commence surveillance of spilled oil and identify the amount, type and direction of movement of the spilled oil. (If necessary, for safety reasons apply approved dispersant in adequate concentration to achieve proper dispersion.)

- Plot the anticipated course of the spilled oil and determine what areas may be affected by the spilled oil. Refer to oil spill trajectory predictions contained in Addendum A. Select the appropriate trajectory depending on the current phase of the tidal cycle (neap or spring) and the present direction of the wind.

- Use the best available means to track the spill if it moves away from the rig. Oil spill movement indicators will be stored on the stand-by vessel. These indicators should be released at the start and end of the spill. The indicators are comprised of large plastic backed sponge rubber mats which are visible from the air. It is important to ensure that these mats are thoroughly wet before deployment and that the plastic backing is uppermost. Observe their location at three hourly intervals.

- Determine marine resources at risk (in path of spill) and their sensitivity to oil and dispersant. Refer to Figures 1-3 and Tables 1-2 in Addendum B. These figures show the:

    - type of shoreline in the region and its sensitivity to oil pollution;
    - known distribution of marine resources in the region;
    - distribution of intertidal and shallow subtidal marine habitats of the region.

  These figures are based on information collated by Jones (Part 2) (1986) and by LeProvost, Semeniuk & Chalmer, Environmental Consultants (LSC), and are also presented in the PER.

  The tables summarise the information available about the sensitivity of various marine assemblages and habitats to oil and the recovery period after damage.

- Determine and initiate appropriate oil spill control strategy. Refer to Figure 1 for strategy options.

  The preferred strategy is to contain the spill with floating oil booms and collect the oil via a skimmer. If this is not possible, the oil boom should be used to divert the spill from particularly sensitive resources such as islands, coral reefs, and mangrove flats.

  Dispersant should not be applied without the approval of the State Combat Committee. Many of the marine resources which occur in the gulf are more sensitive to an oil/dispersant mix than to the oil itself. Therefore dispersant use is to be strictly avoided except in only one situation and even then only with the approval of the State Combat Committee.

  The application of dispersant should be considered only if the spill is deemed to make landfall in the mangrove flats which border the eastern and southern shores of the gulf. Mangroves are known to be less sensitive to oil/dispersant mixes than to oil alone and dispersant use may be required to save them from damage. Mangroves have been identified in the PER as being the most important ecological resource in the gulf and as such are to be protected at all costs.

  For all shoreline types in the gulf other than mangroves, the oil can be allowed to beach if containment and diversion measures fail. The best method of treating beached oil will be to allow it to degrade by natural means and to monitor the recovery of the shoreline assemblage affected. Recovery will be relatively quick since light Australian crude oil rapidly weathers because of its volatility. In addition, natural factors which affect the weathering rate operate more rapidly in tropical environments than in temperate ones. Dispersants must not be used to clean these oiled shorelines as they are likely to cause more damage than the oil itself. Any additional cleaning that is warranted can be performed by the application of absorbents, raking and earth moving.

3.2 PHASE 2 - SPILL CONTROL BEYOND COMPANY CAPACITY

- Advise MOSAP Regional Industry Controller that the spill is beyond the Company's capacity and request assistance; then advise the State Combat Committee and relevant Government Departments (refer to Table 2 for list of departments to be notified). Addendum C lists all emergency telephone numbers for the appropriate personnel.

3.3 PHASE 3 - SPILL CONTROL BEYOND MOSAP CAPACITY

- Advise Department of Mines and State Combat Committee that spill control is beyond MOSAP and company capacity, and request assistance from National Plan.

4 EQUIPMENT AVAILABLE TO HANDLE AN OIL SPILL

The equipment available to handle an oil spill includes:

- company chartered workboats and helicopters at the drill site and shore bases;
- equipment available through the Western Australian Offshore Operators Oil Spill Equipment (WAOOSE) contract; and
- equipment which can be called upon through the PIECE MOSAP.

The mobilisation times for the major equipment is shown in the attached equipment logistics plan (Addendum D). Additional aircraft, boats, dispersants and absorbents are available through MOSAP. These facilities are listed in Addendum E.

The following equipment will be available on site:

- Dispersants

  Five drums (1 000 L) of Corexit 9527 or an approved equivalent will be stored on the drilling rig. A further five drums will be stored on the stand-by vessel together with a spray applicator.

  Fifty drums (10 000 L) of Corexit 9527 or an approved equivalent is palletised and available in Port Hedland through WAOOSE contract, to which Minora will be a party.

  A detailed list of dispersant sources is given in dispersant logistics (Addendum F).

- Helicopter

  The helicopter servicing the rig will be available for evaluating the size of the spill and monitoring its movement under the influence of winds and currents. It will be available for aerial spraying of dispersant if necessary.

- Booms and Skimmers

  A BP Vikoma Seapak boom and handling equipment and a BP Vikoma Seaskimmer will be available. Similar equipment is available in Port Hedland under the WAOOSE contract. A detailed list of booms and skimmers is given in Addendum G - Containments and Recovery Equipment Location.

5 REPORTING

A written report will be sent to the Western Australian Department of Mines stating:

(i) the time and place of escape;
(ii) the estimated amount of oil spilled;
(iii) the direction of oil dispersal and the areas affected by the spill;
(iv) any resultant environmental damage;
(v) conditions believed to have contributed to the escape;
(vi) all actions taken to control the spill (detailed log of comments).

6 ENVIRONMENTAL MONITORING

Environmental surveys to determine the effect of the spill will be conducted if the oil comes into contact with any sensitive resources or shorelines. Surveys are not required if the spill disperses out to sea.

To allow determination of the effects of the oil spill it is essential to know where the oil spill has been and where it has beached. Therefore oil spill tracking as suggested in Section 3 is of paramount importance. It is also important to mobilise the environmental adviser to the site as soon as practicable.

Once the area affected has been identified, surveys will be conducted to initially determine the environmental effect of the spill, and subsequently to determine the rate and success of recovery of the affected habitats. Various monitoring techniques will be employed depending on the nature of the substrate and assemblage affected. Hydrocarbon analyses of sediments and biota will also be obtained.

A report detailing the results of the surveys and providing recomendations for follow-up work will be produced and submitted to relevant Government authorities [EPA, Department of Conservation and Land Management (CALM), Department of Fisheries, Department of Mines].

7 REFERENCES (for Appendix 5 and Addendum A-G)

DEPARTMENT OF CONSERVATION AND ENVIRONMENT, 1984: Procedures for protection of the Western Australian environment from oil spills. Dept Conserv. & Environ., West. Aust., Bull. No. 104.

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HYLAND, J.L., & SCHNEIDER, E.D., 1977: Petroleum hydrocarbons and their effects on marine organisms, populations, communities and ecosystems. In: Sources, Effects and Sinks of Hydrocarbons in the Aquatic Environment. American Institute of Biological Sciences, Washington D.C., 463-506.

IMCO/UNEP, 1982: The status of oil pollution and oil pollution control in the West and Central African Region and UNEP Regional Seas Reports and Studies. No. 4, UNEP 1982.

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TABLE 1

HANDLING AN OIL SPILL WITHIN THE COMPANY'S CAPACITY

Spill Observed

Notify

Rig Drilling Supervisor — Mobilise — Helicopters, Workboats, Dispersants

Notify

Drilling Manager Perth Office — Mobilise — Onshore Equipment, Absorbents

Notify

Western Australian Operator's Oil Spill Equipment Group
Contact: Brambles Manford Perth

Perth Office

Notify

MOSAP* Regional Industrial Controller

Western Australian State Combat Committee

Western Australian Department of Mines

Western Australian Department of Fisheries and Wildlife

Environmental Protection Authority

Commonwealth Department of Transport and Construction

Western Australian Department of Marine and Harbours

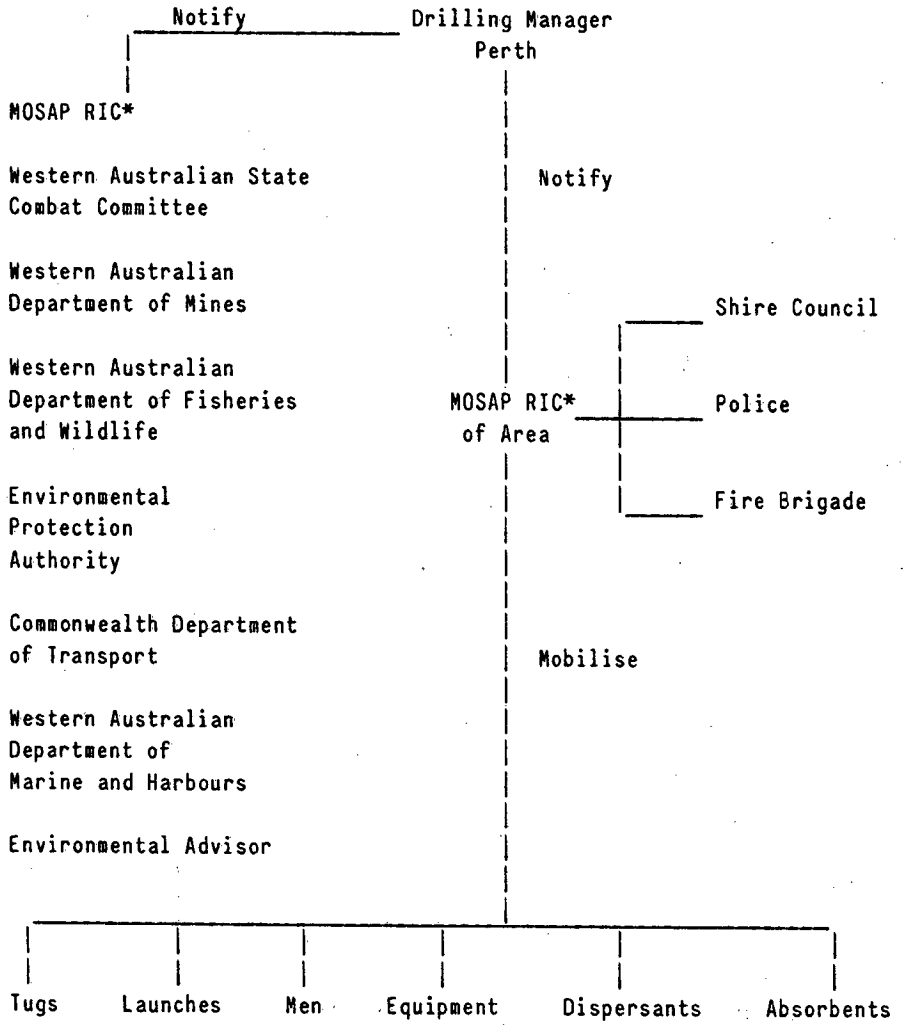
Environmental Advisor

*Marine Oil Spill Action Plan

TABLE 2

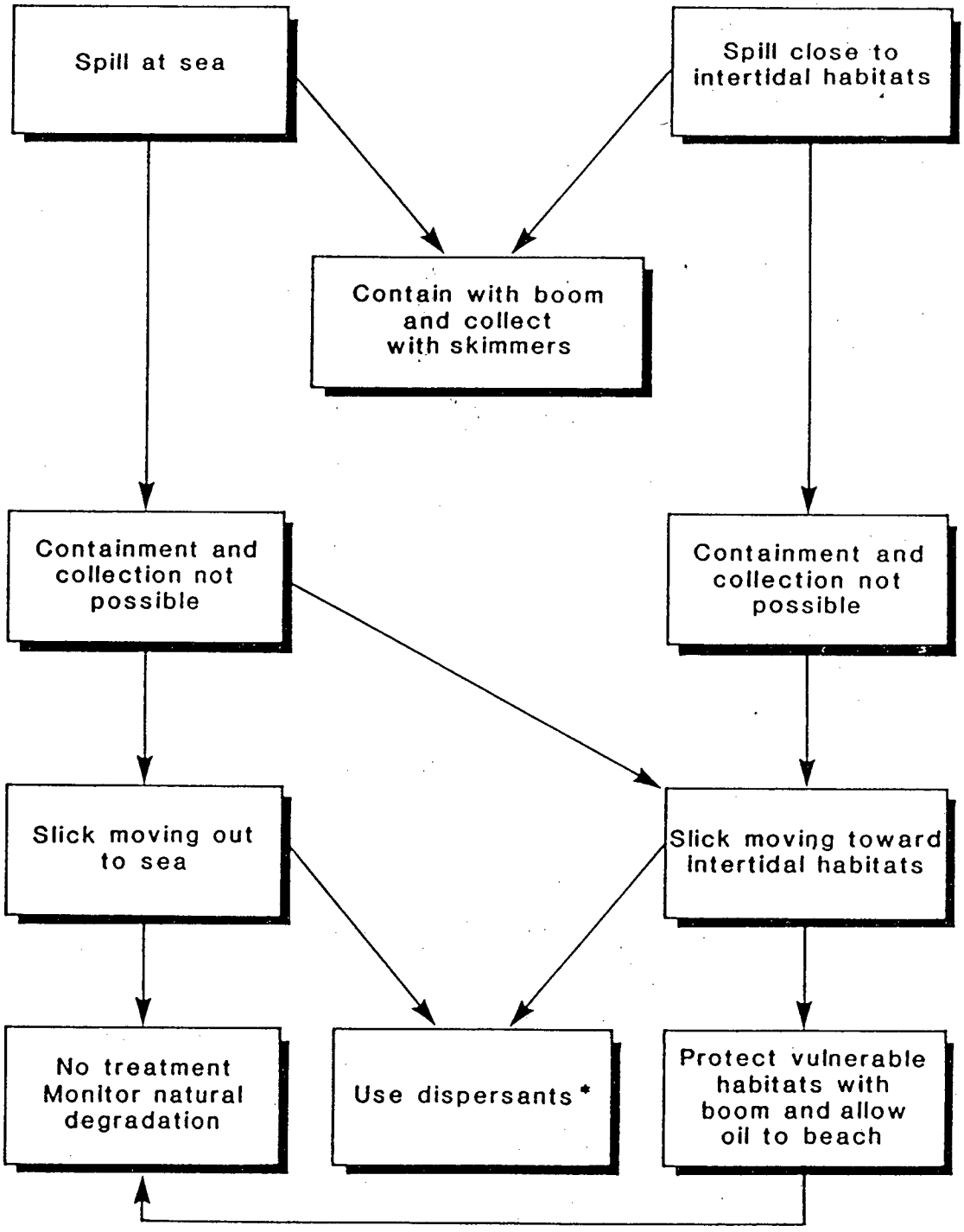
HANDLING A LARGE OIL SPILL BEYOND

THE COMPANY'S HANDLING CAPACITY



Locations at which these facilities are mobilised will depend upon the magnitude of the spill and the area likely to be affected.

*Marine Oil Spill Action Plan Regional Industrial Controller



*Only in consultation with Environmental Protection Authority and State Combat Committee

LeProvost Semeniuk & Chalmer Environmental Consultants	Comp: I. LeProvost Drawn : Environmental Date : March 1988	Minora Resources N.L. **STRATEGY PLAN FOR OIL SPILL TREATMENT**	Figure **1**

J156

ADDENDUM A

ADDENDUM A

OIL SPILL TRAJECTORIES

FOR VARIOUS WIND AND TIDE CONDITIONS

EXMOUTH GULF

EXPLANATORY NOTE

Identification of the resources at risk from an oil spill requires information on the likely disposal flow path of a spill under various wind and tide conditions. Therefore, oil spill trajectory predictions have been prepared for simulated oil spills at the two prospect locations. These simulations were conducted by Steedman Limited and detail is presented in Appendix 2 of the Public Environmental Review (PER). Only the simulations are presented here with the following explanatory note.

- A total of 18 case studies are available for each prospect location.
- Simulations are available for eight different wind directions (the cardinal directions: north, northeast, east, southeast, south southwest, west and northwest) plus one case with no winds (calm conditions).
- Each of the above simulations is available for two currents corresponding to spring and neap tides.
- Each case study is presented in a separate figure.
- Each case study presents four sets of trajectory envelopes for the maximum extent of oil travel after six, 12, 24 and 48 hours from release under a steady wind speed of 10 ms^{-1} (20 knots).
- The grid and coastline used with the numerical circulation model on which the trajectories are based is shown in Figure 1.

The case studies are presented in the following sequence.

PROSPECT	WIND DIRECTION	TIDAL PHASE	FIGURE NUMBER
Whalebone	No wind	Spring	2
	No wind	Neap	3
	North	Spring	4
	North	Neap	5
	Northeast	Spring	6
	Northeast	Neap	7
	East	Spring	8
	East	Neap	9
	Southeast	Spring	10
	Southeast	Neap	11
	South	Spring	12
	South	Neap	13

PROSPECT	WIND DIRECTION	TIDAL PHASE	FIGURE NUMBER
Whalebone (cont'd)	Southwest	Spring	14
	Southwest	Neap	15
	West	Spring	16
	West	Neap	17
	Northwest	Spring	18
	Northwest	Neap	19
Rivoli	No wind	Spring	20
	No wind	Neap	21
	North	Spring	22
	North	Neap	23
	Northeast	Spring	24
	Northeast	Neap	25
	East	Spring	26
	East	Neap	27
	Southeast	Spring	28
	Southeast	Neap	29
	South	Spring	30
	South	Neap	31
	Southwest	Spring	32
	Southwest	Neap	33
	West	Spring	34
	West	Neap	35
	Northwest	Spring	36
	Northwest	Neap	37

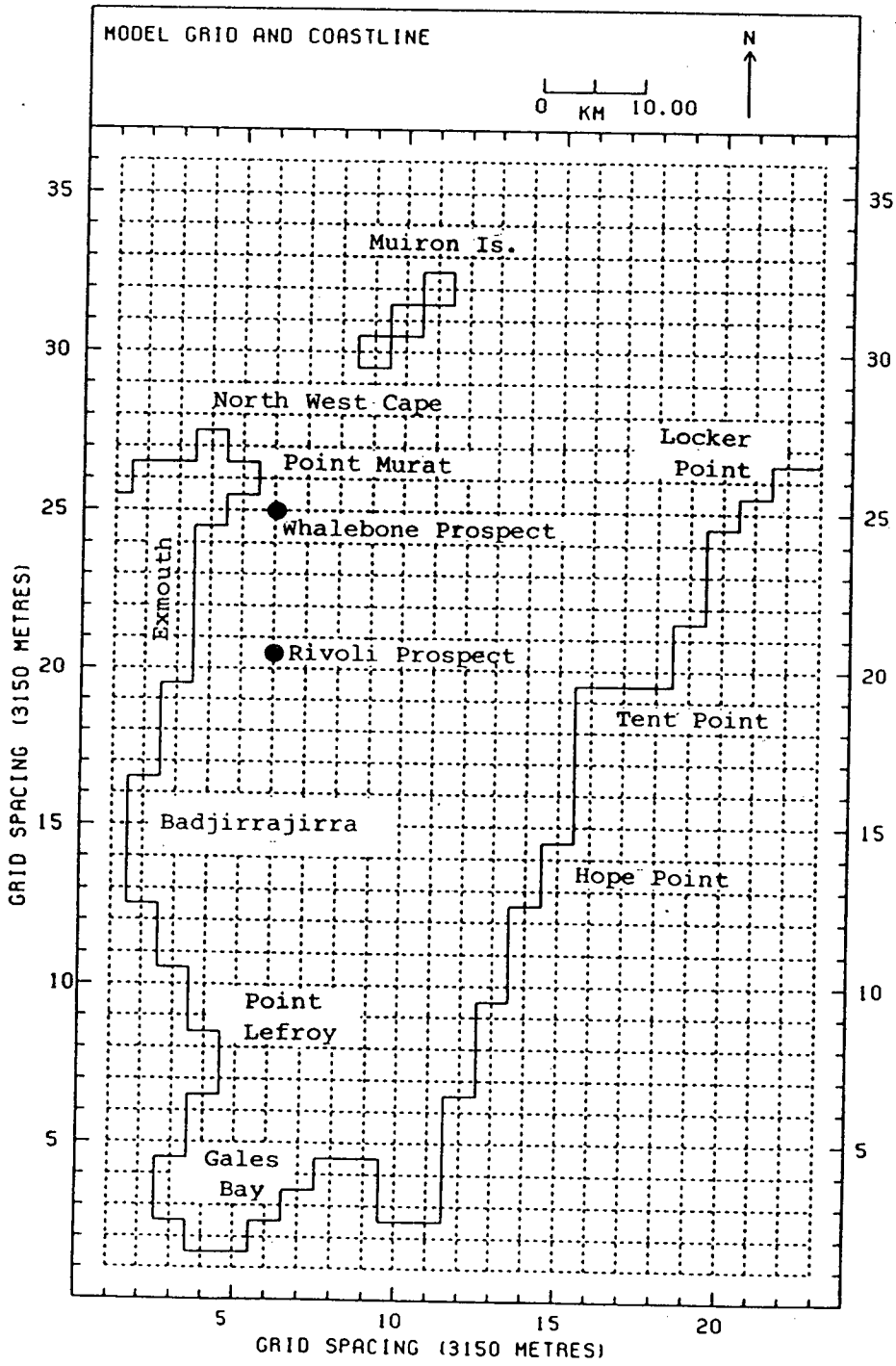


Figure 1 Grid and coastline used with the numerical circulation model from Steedman Limited.

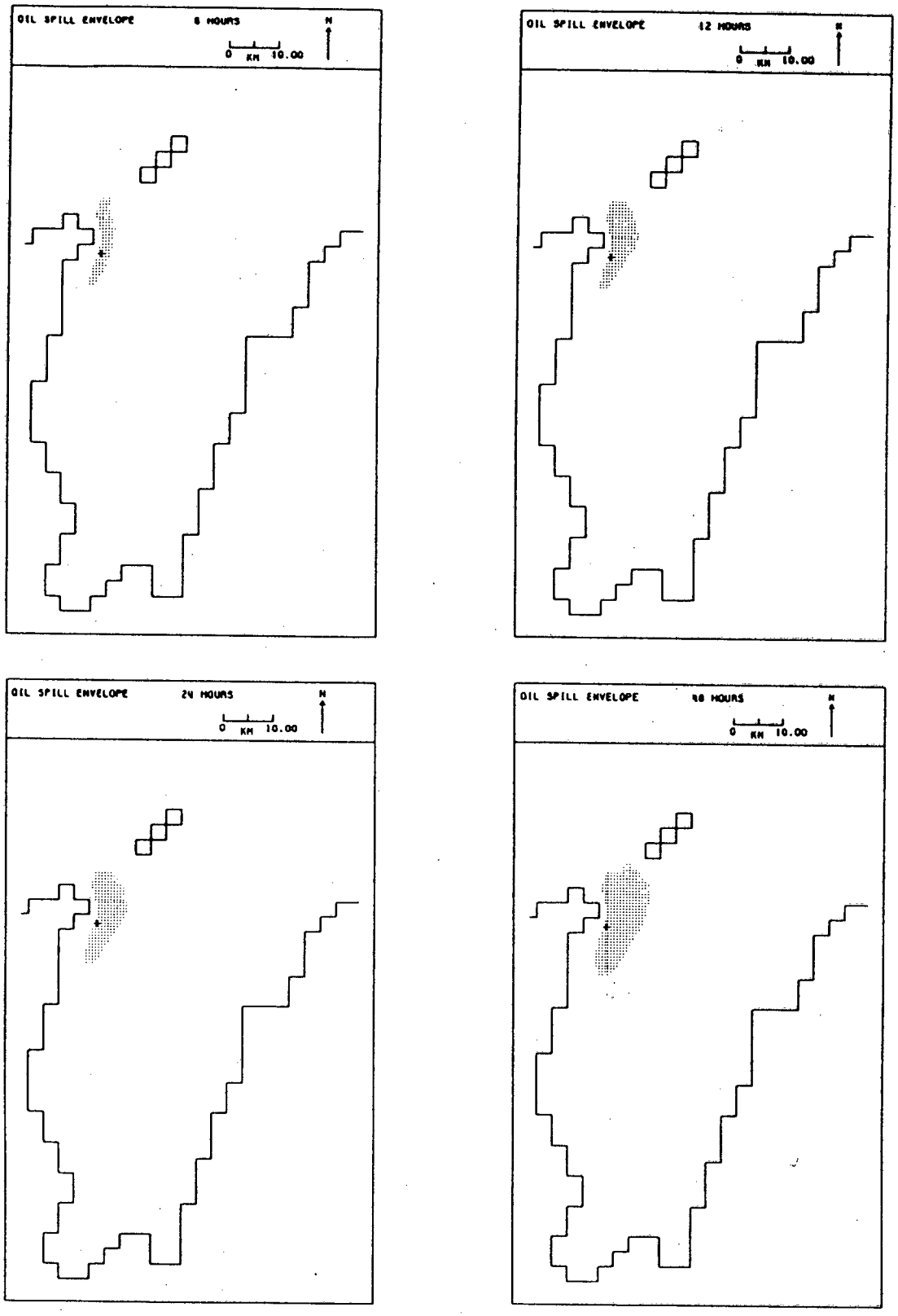


Figure 2 Oil spill envelopes for release times of 6, 12, 24 and 48 hours for the case of spring tides only for Whalebone Prospect from Steedman Limited.

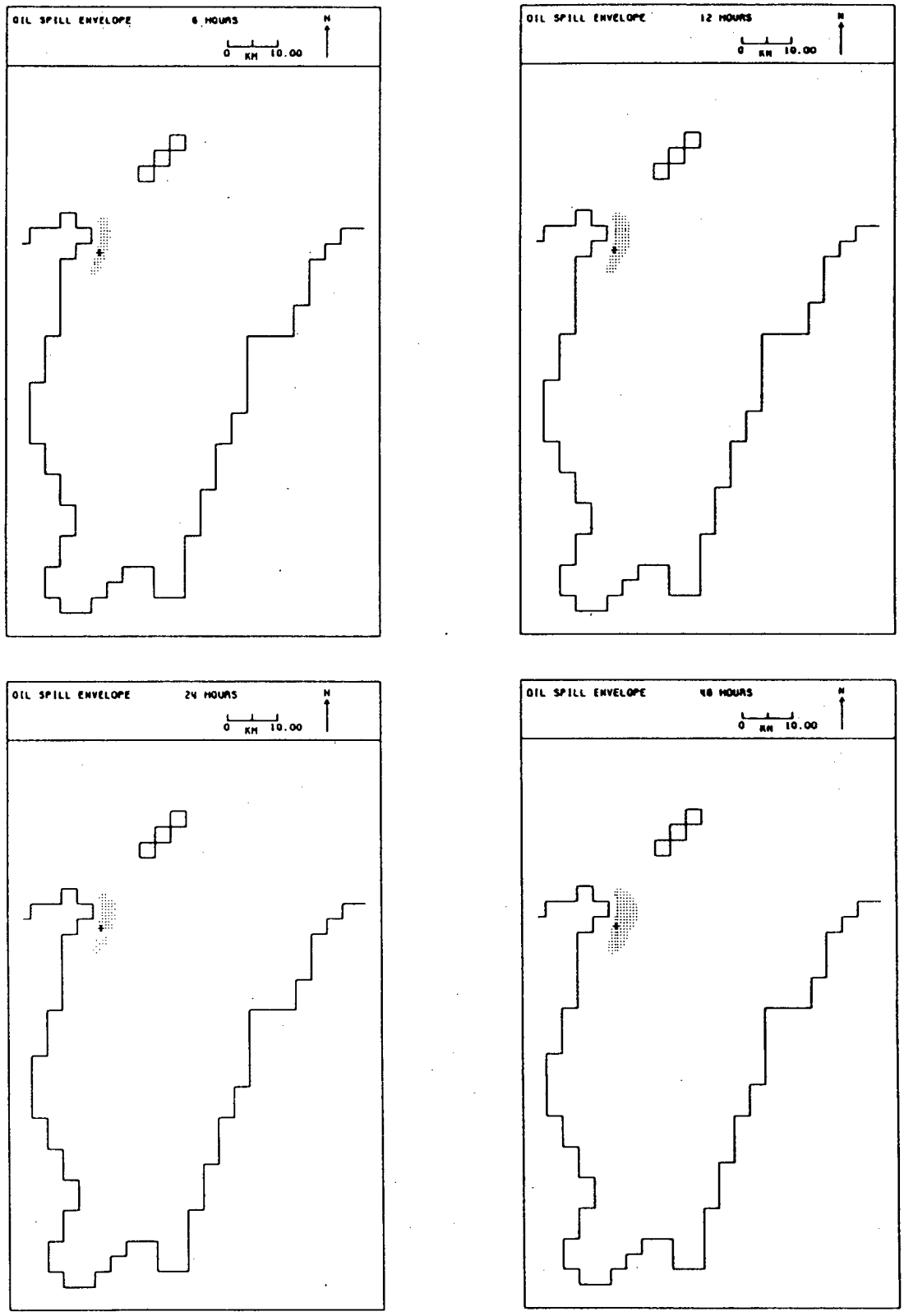


Figure 3 Oil spill envelopes for release times of 6, 12, 24 and 48 hours for the case of neap tides only for Whalebone Prospect from Steedman Limited.

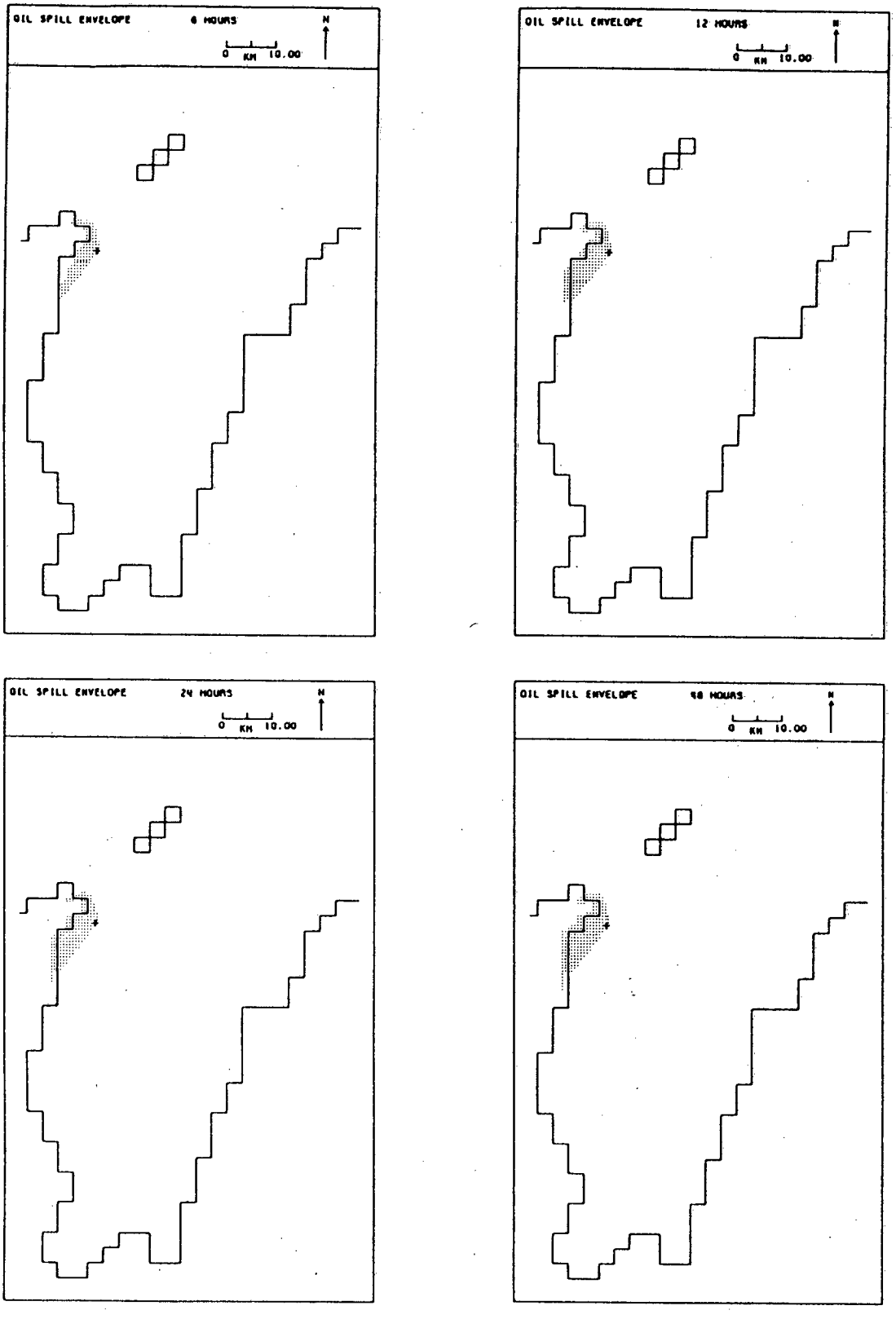


Figure 4 Oil spill envelopes for release times of 6, 12, 24 and 48 hours for the case of a 10 m s^{-1} northerly wind during spring tides for Whalebone Prospect from Steedman Limited.

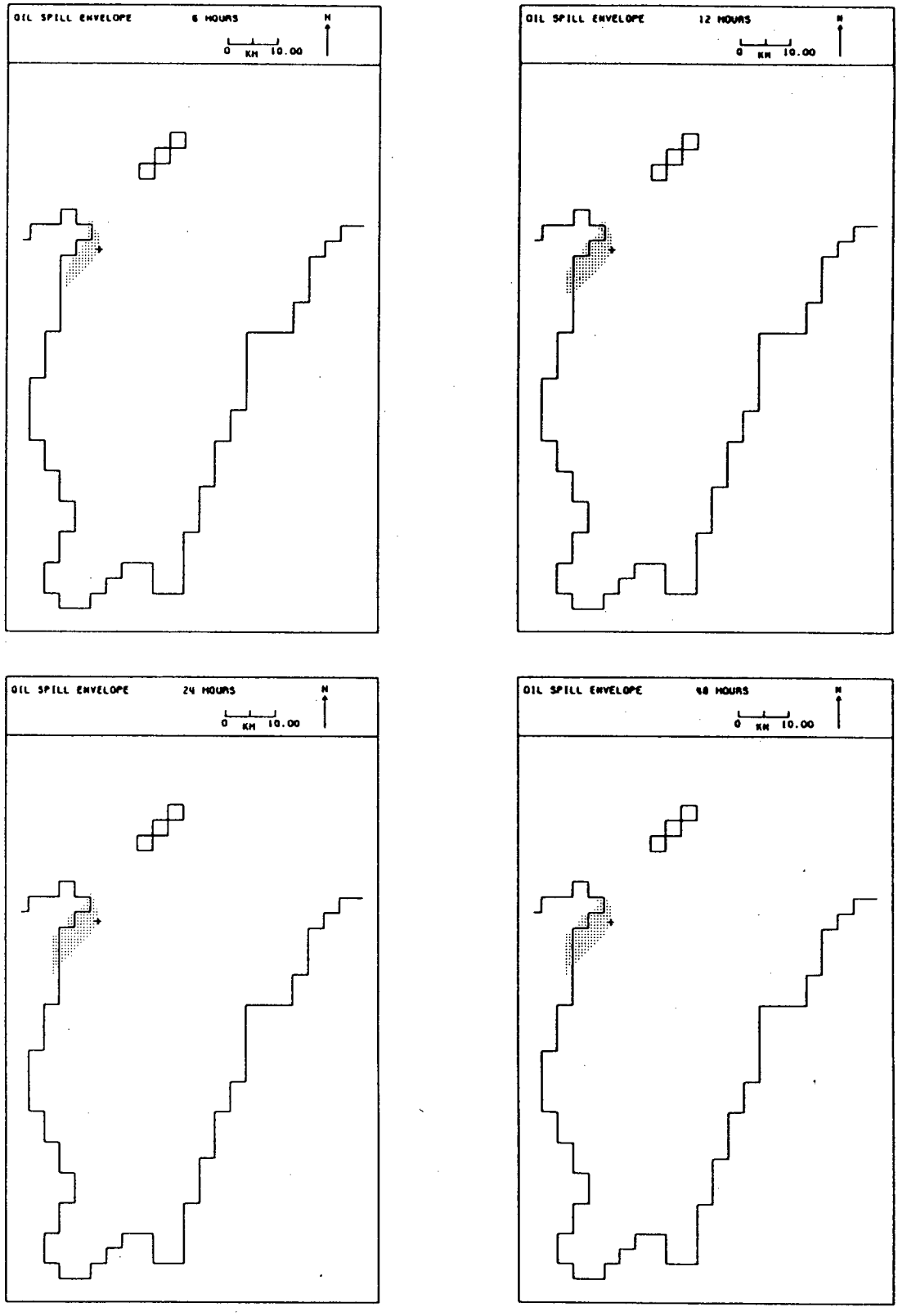


Figure 5 Oil spill envelopes for release times of 6, 12, 24 and 48 hours for the case of a 10 m s^{-1} northerly wind during neap tides for Whalebone Prospect from Steedman Limited.

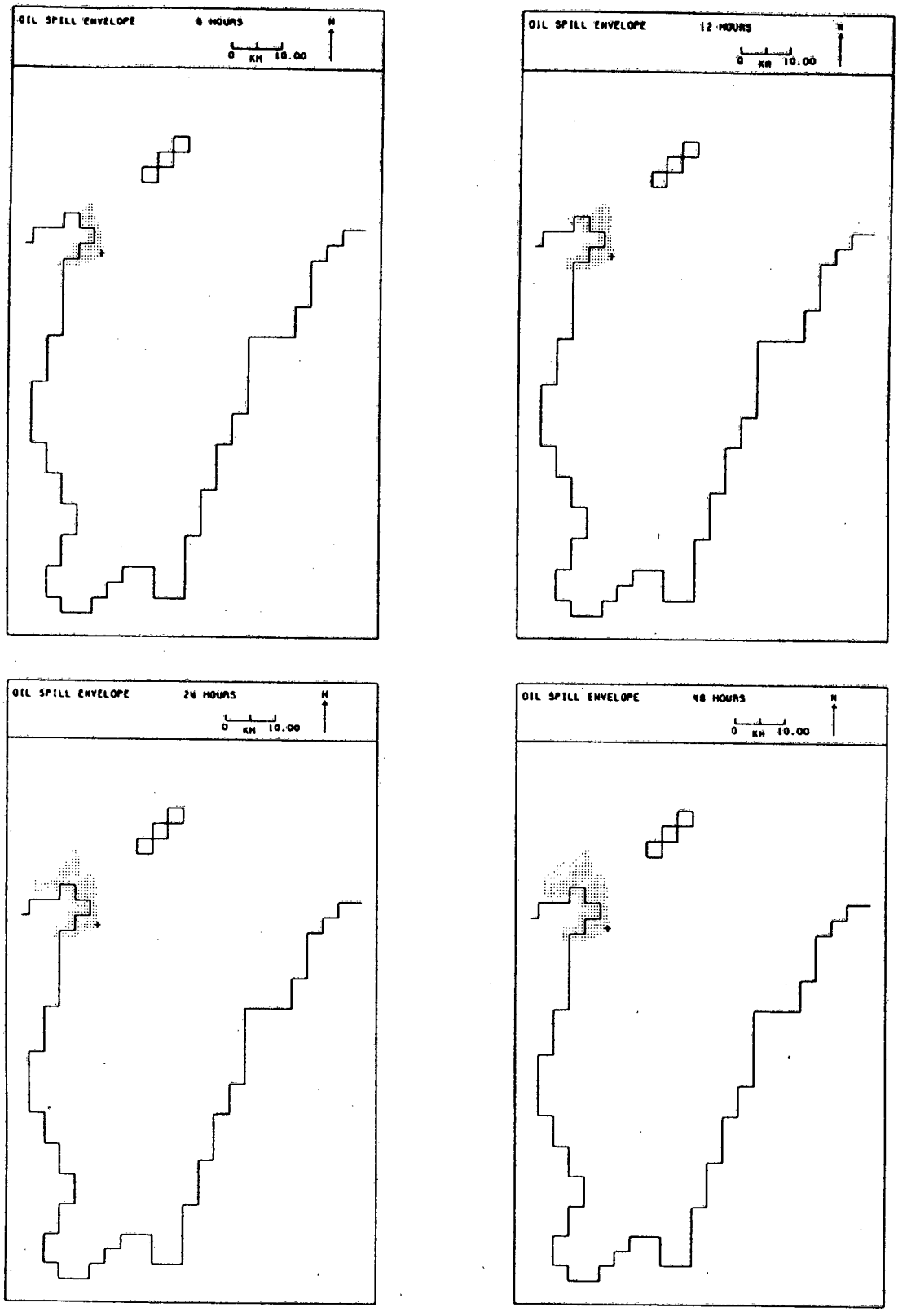


Figure 6 Oil spill envelopes for release times of 6, 12, 24 and 48 hours for the case of a 10 m s^{-1} north-easterly wind during spring tides for Whalebone Prospect from Steedman Limited.

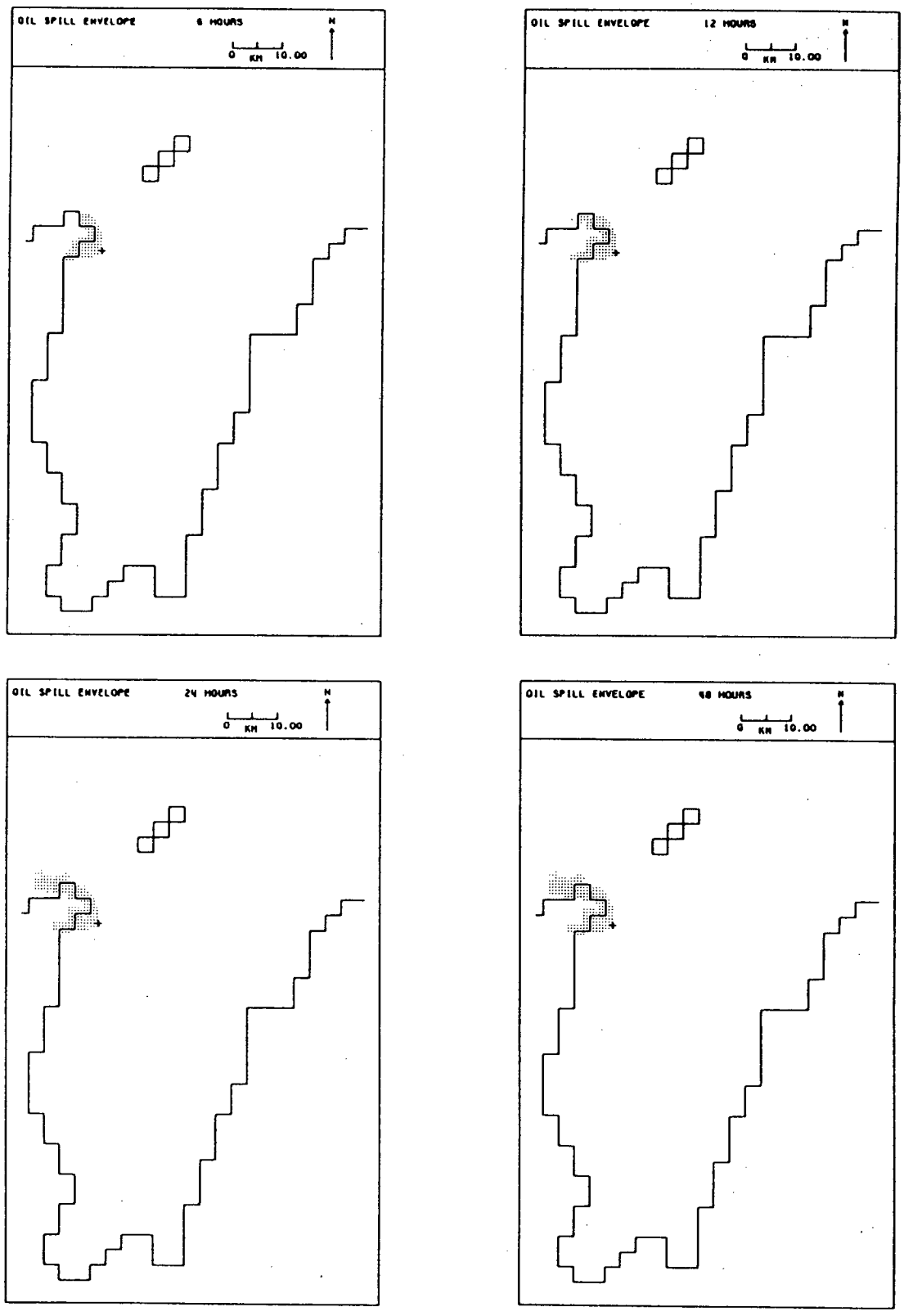


Figure 7 Oil spill envelopes for release times of 6, 12, 24 and 48 hours for the case of a 10 m s^{-1} north-easterly wind during neap tides for Whalebone Prospect from Steedman Limited.

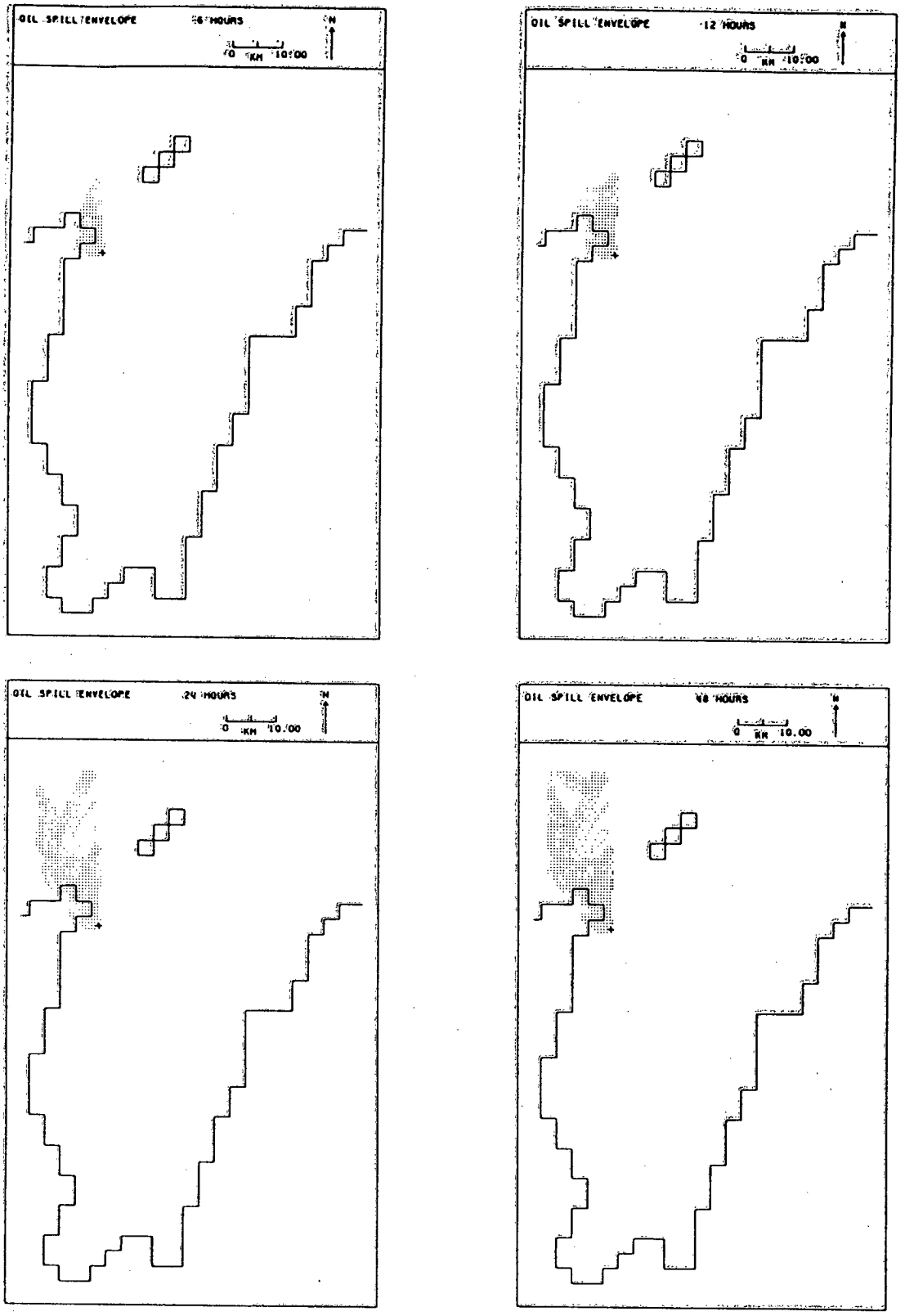


Figure 8 Oil spill envelopes for release times of 6, 12, 24 and 48 hours for the case of a 10 m s^{-1} easterly wind during spring tides for Whalebone Prospect from Steedman Limited.

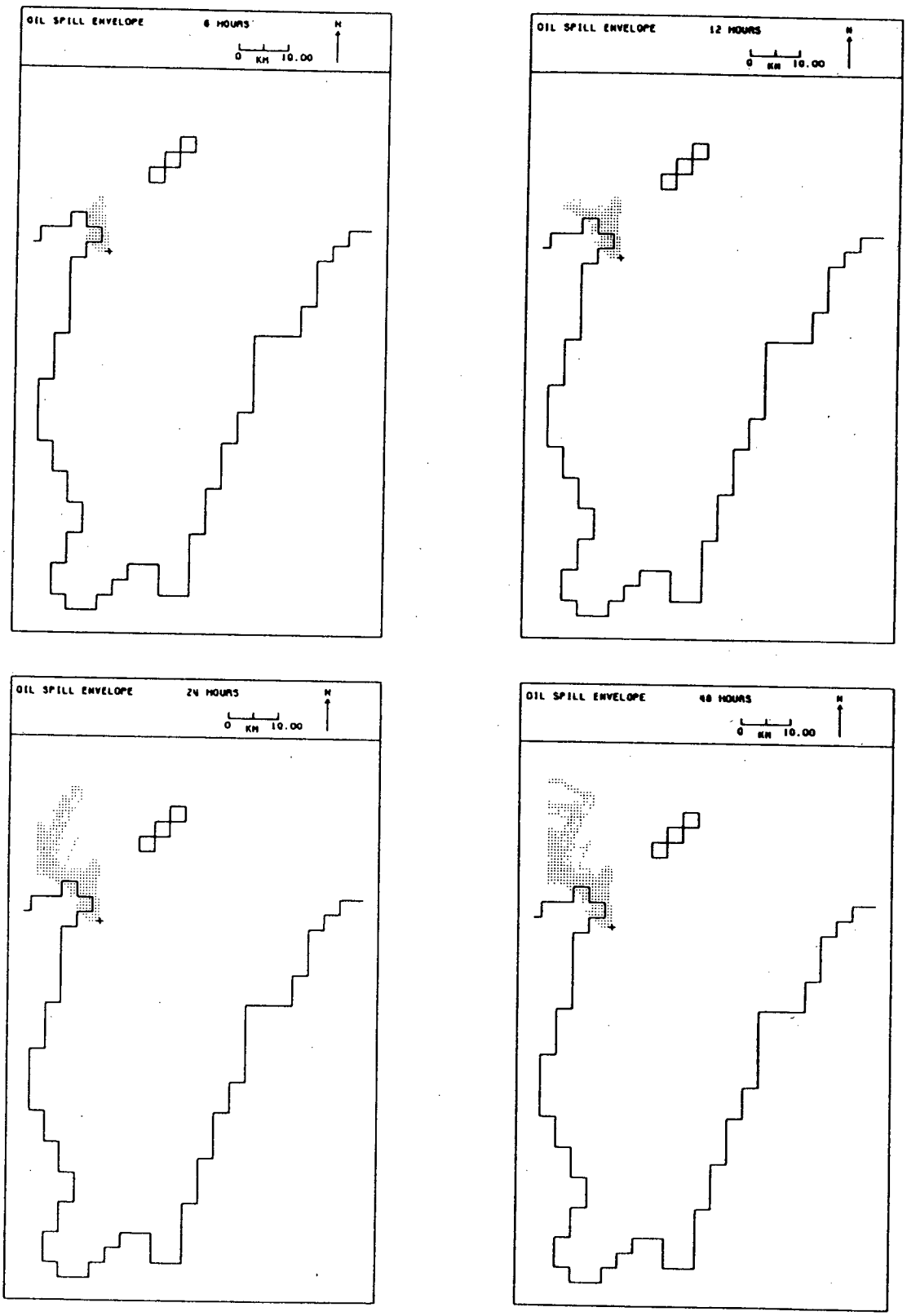


Figure 9 Oil spill envelopes for release times of 6, 12, 24 and 48 hours for the case of a 10 m s^{-1} easterly wind during neap tides for Whalebone Prospect from Steedman Limited.

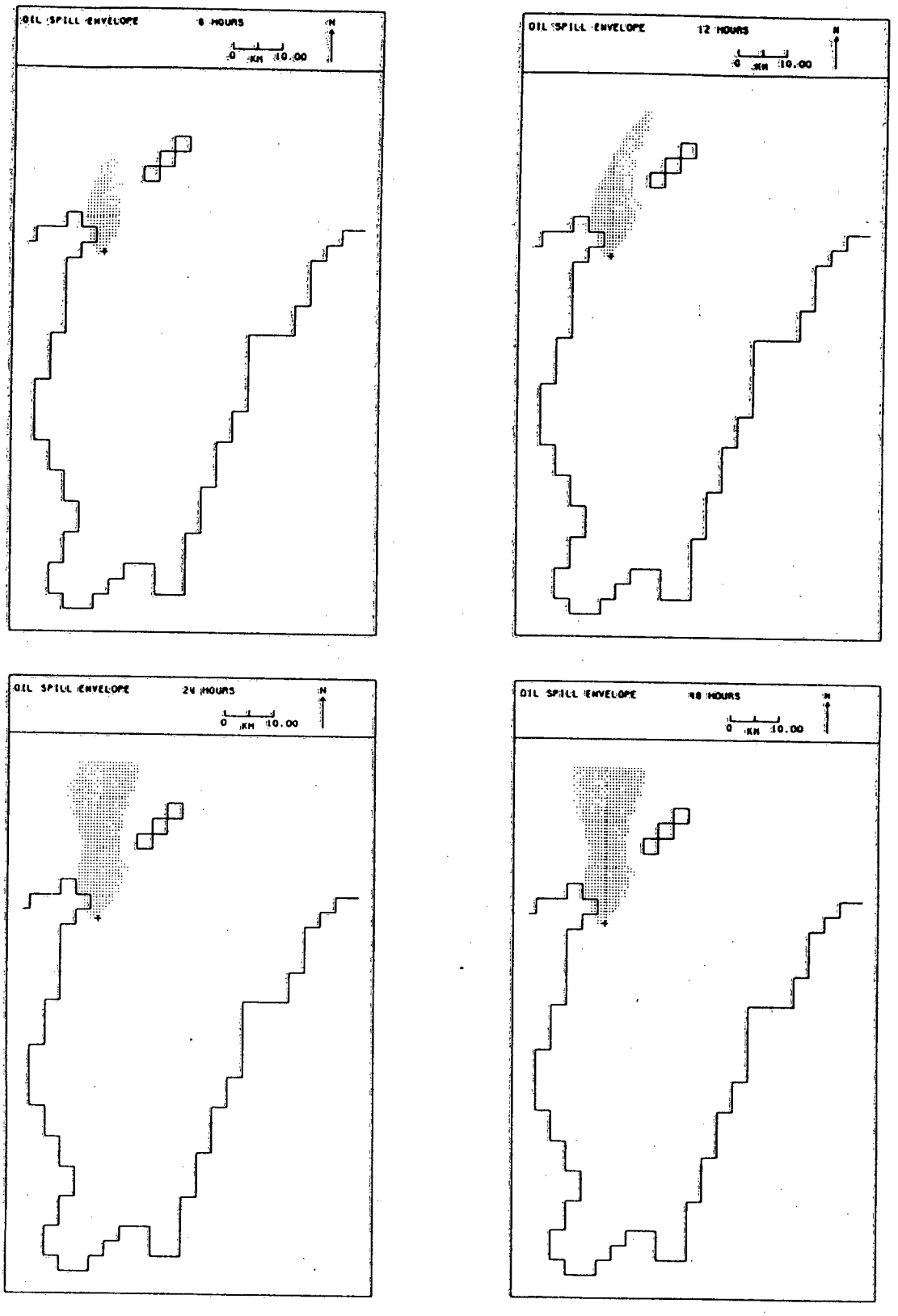


Figure 10 Oil spill envelopes for release times of 6, 12, 24 and 48 hours for the case of a 10 m s^{-1} south-easterly wind during spring tides for Whalebone Prospect from Steedman Limited.

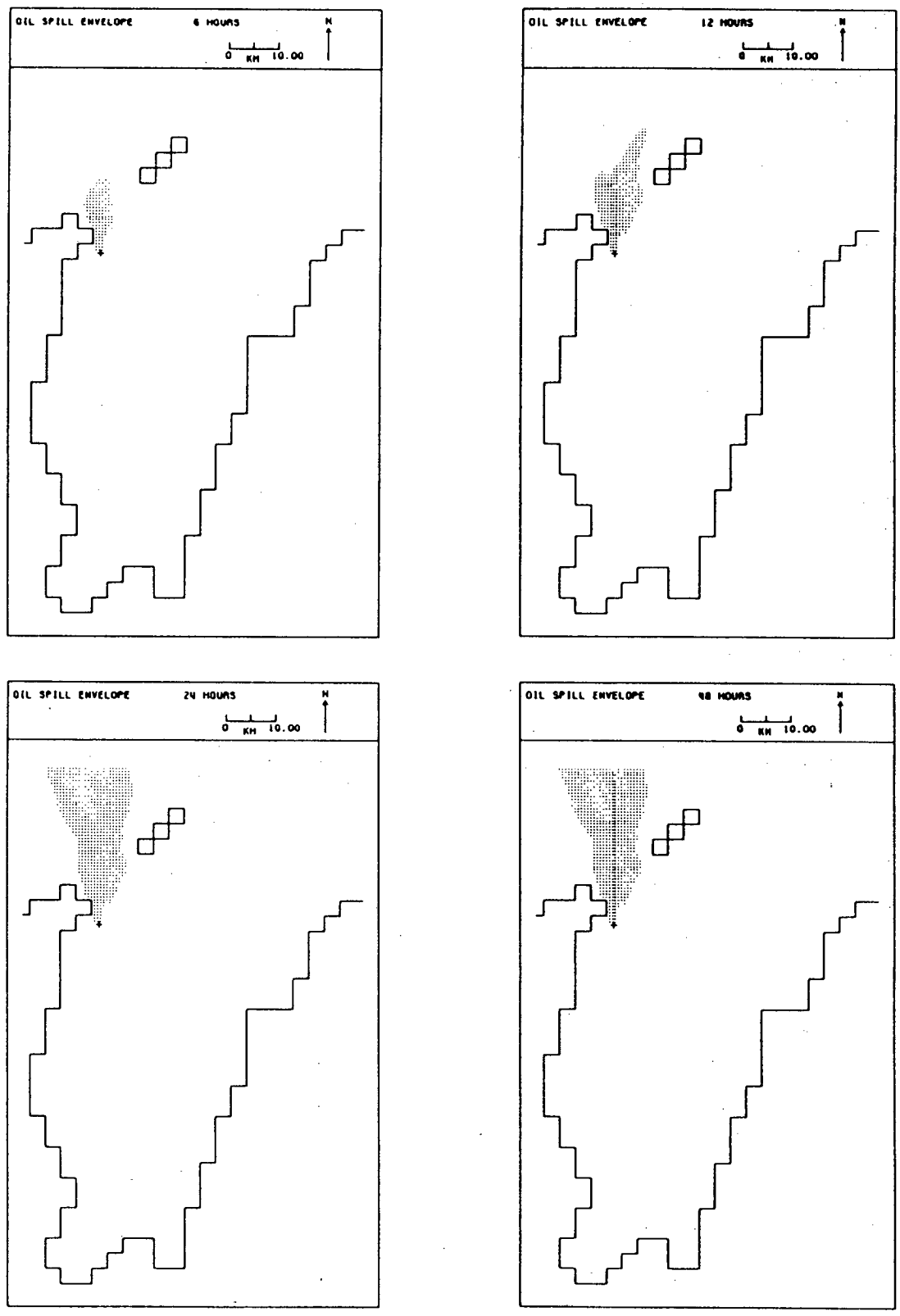


Figure 11 Oil spill envelopes for release times of 6, 12, 24 and 48 hours for the case of a 10 m s^{-1} south-easterly wind during neap tides for Whalebone Prospect from Steedman Limited.

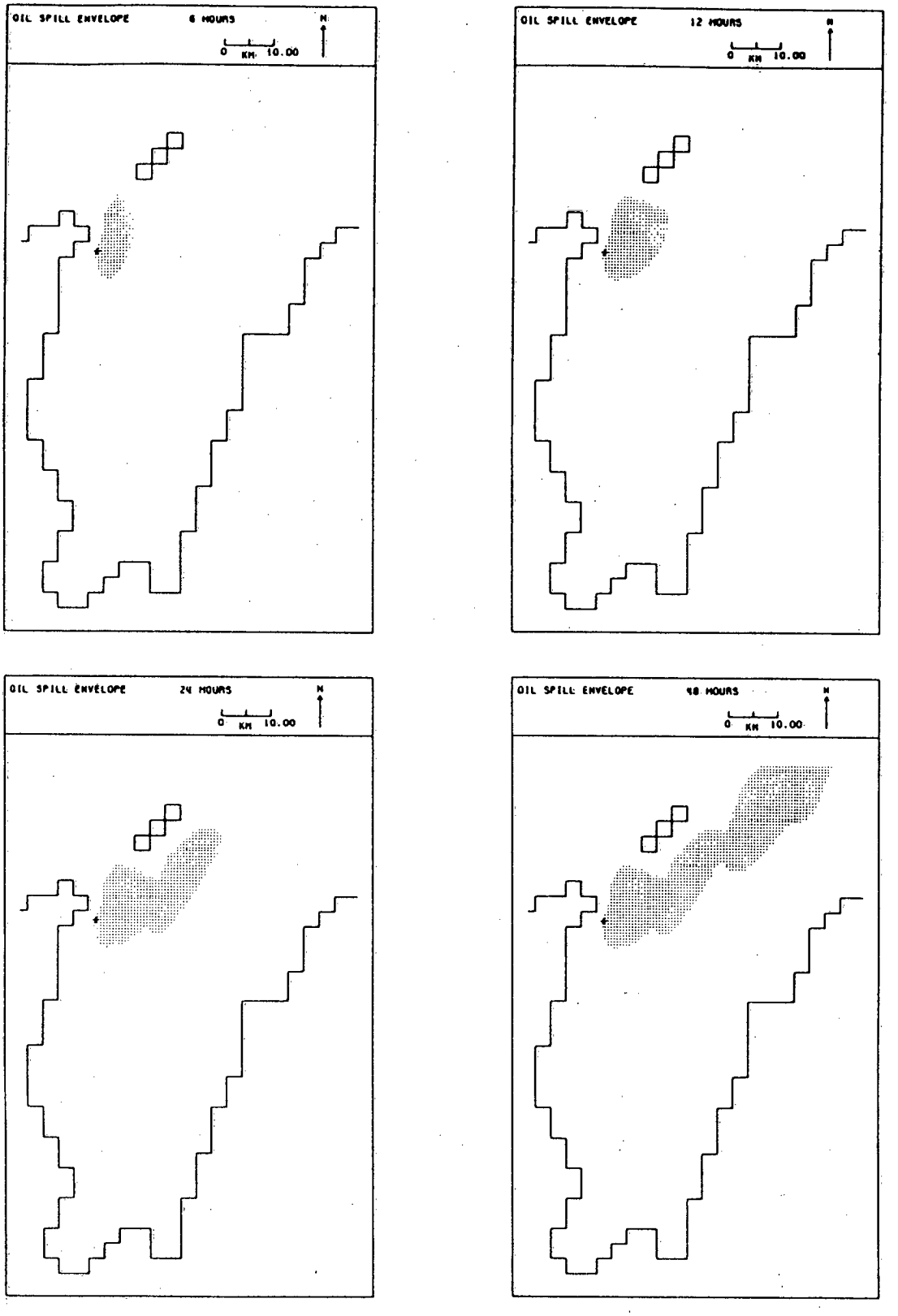


Figure 12 Oil spill envelopes for release times of 6, 12, 24 and 48 hours for the case of a 10 m s^{-1} southerly wind during spring tides for Whalebone Prospect from Steedman Limited.

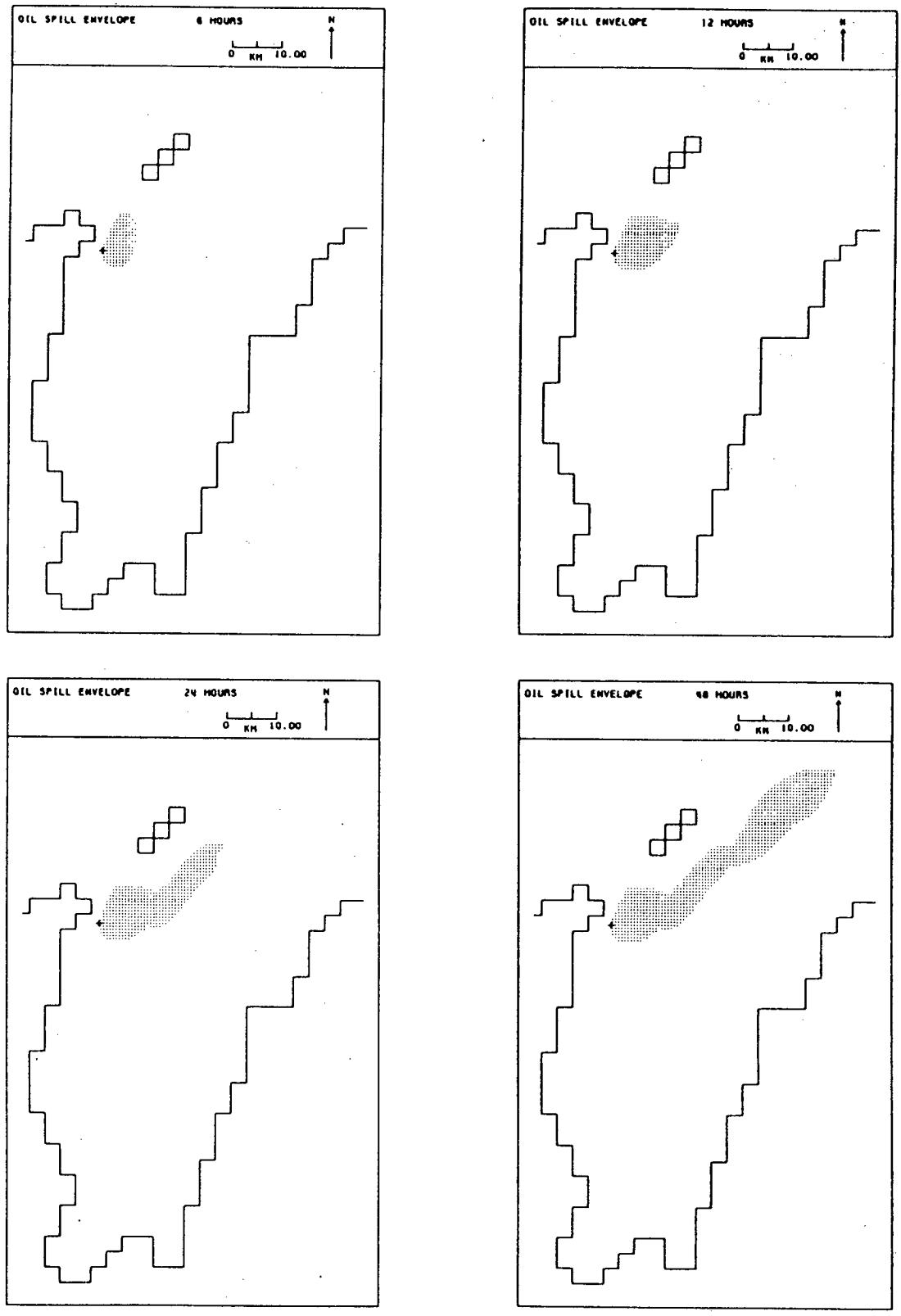


Figure 13 Oil spill envelopes for release times of 6, 12, 24 and 48 hours for the case of a 10 m s^{-1} southerly wind during neap tides for Whalebone Prospect from Steedman Limited.

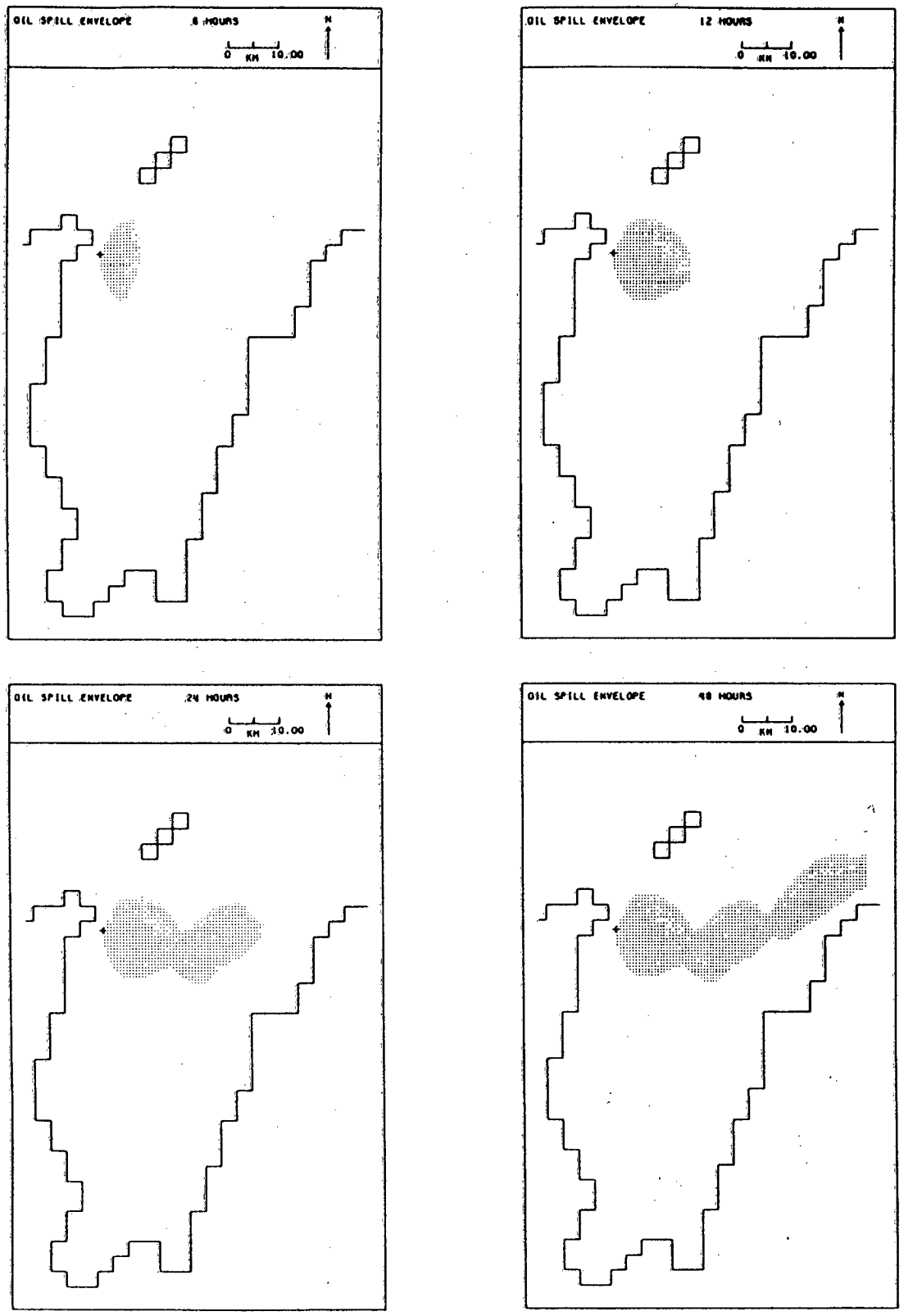


Figure 14 Oil spill envelopes for release times of 6, 12, 24 and 48 hours for the case of a 10 m s^{-1} south-westerly wind during spring tides for Whalebone Prospect from Steedman Limited.

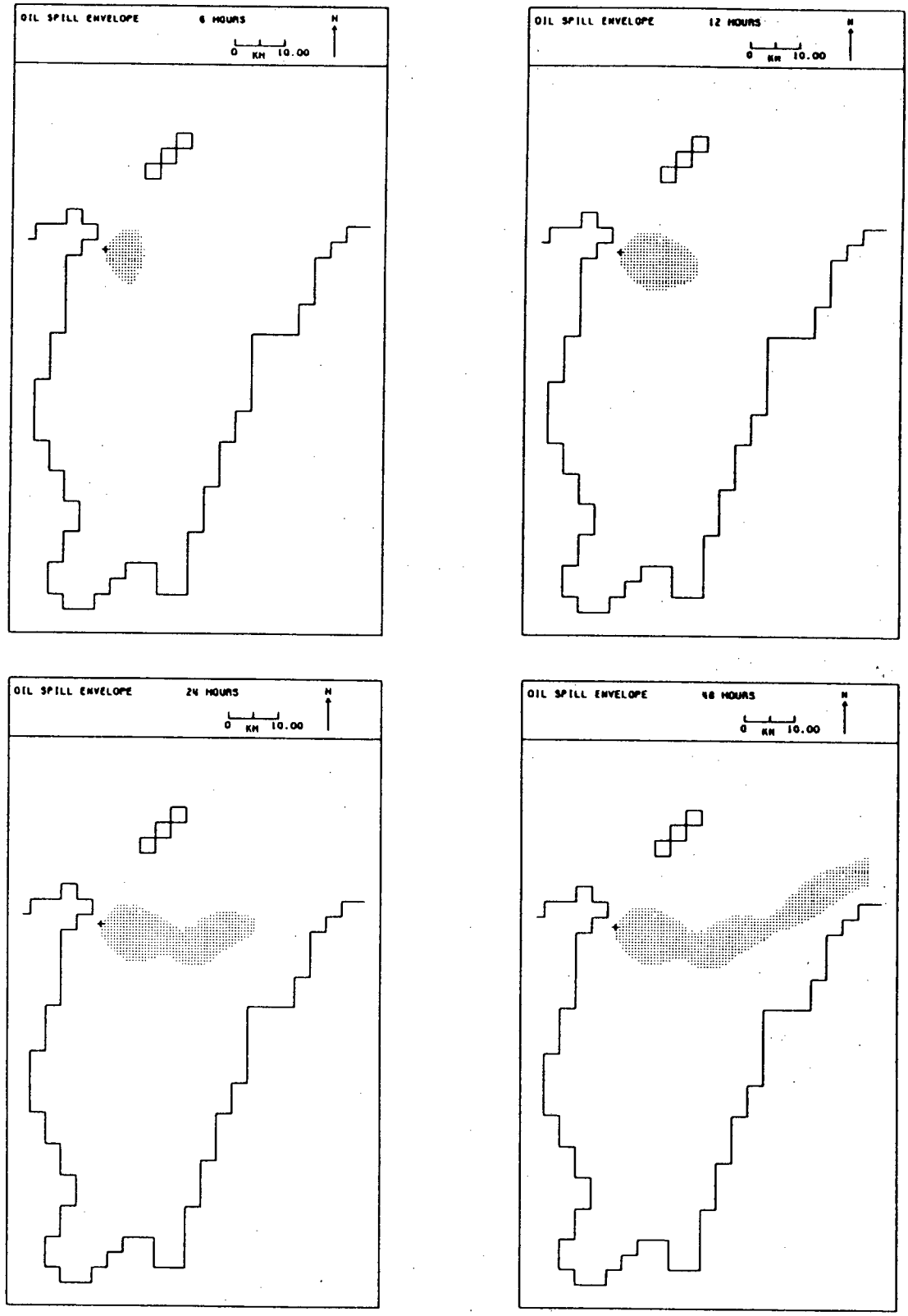


Figure 15 Oil spill envelopes for release times of 6, 12, 24 and 48 hours for the case of a 10 m s^{-1} south-westerly wind during neap tides for Whalebone Prospect from Steedman Limited.

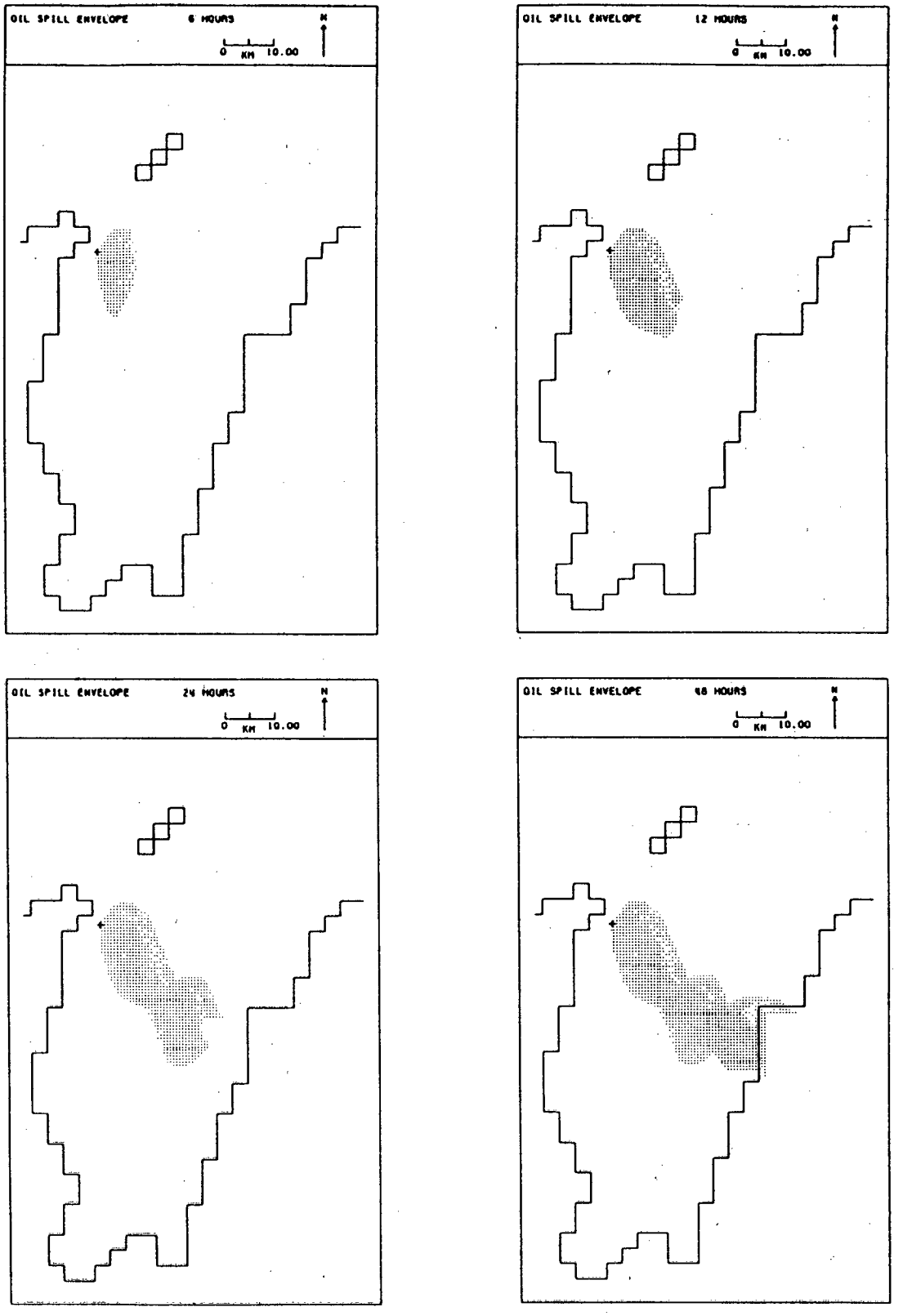


Figure 16 Oil spill envelopes for release times of 6, 12, 24 and 48 hours for the case of a 10 m s^{-1} westerly wind during spring tides for Whalebone Prospect from Steedman Limited.

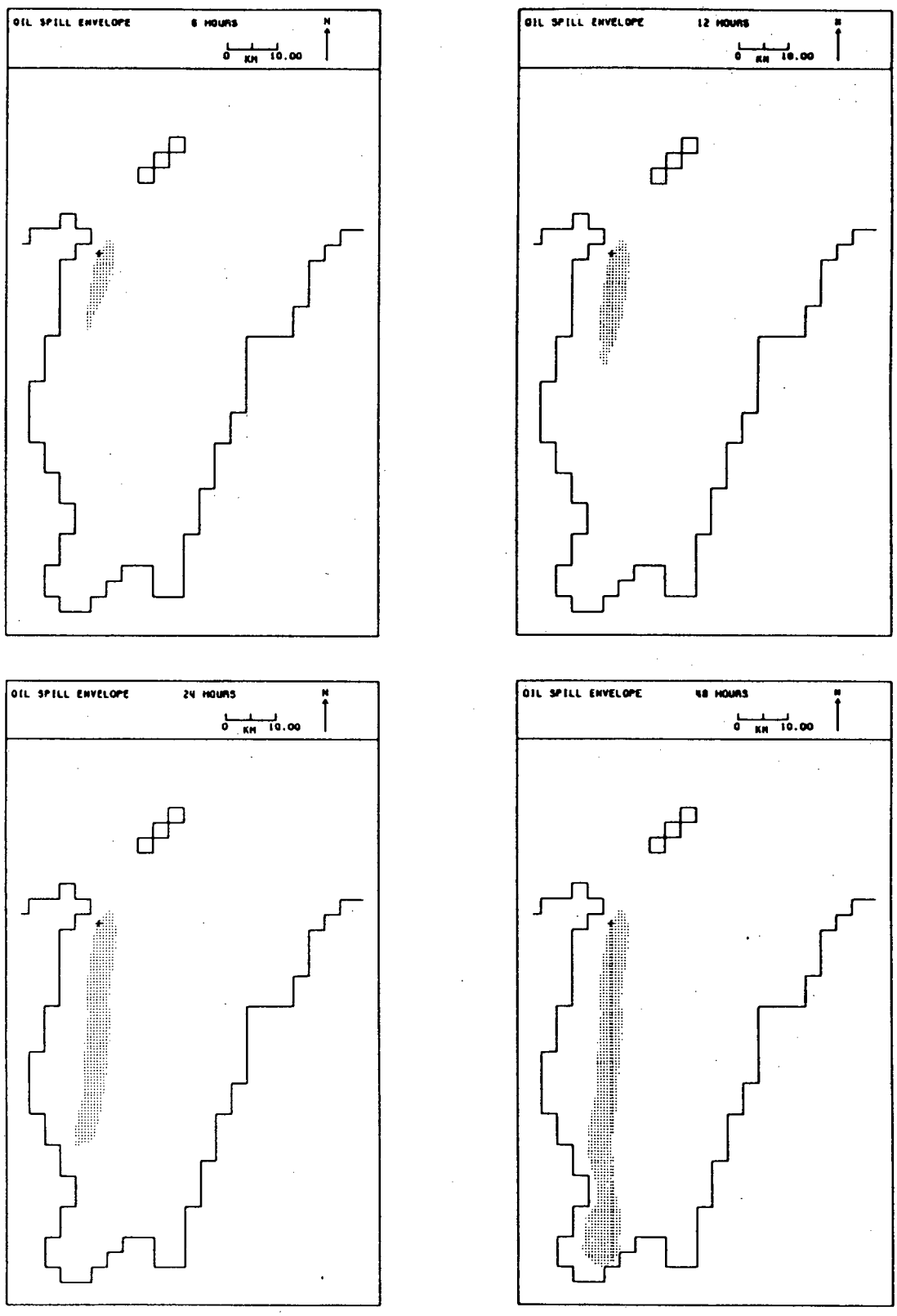


Figure 18 Oil spill envelopes for release times of 6, 12, 24 and 48 hours for the case of a 10 m s^{-1} north-westerly wind during spring tides for Whalebone Prospect from Steedman Limited.

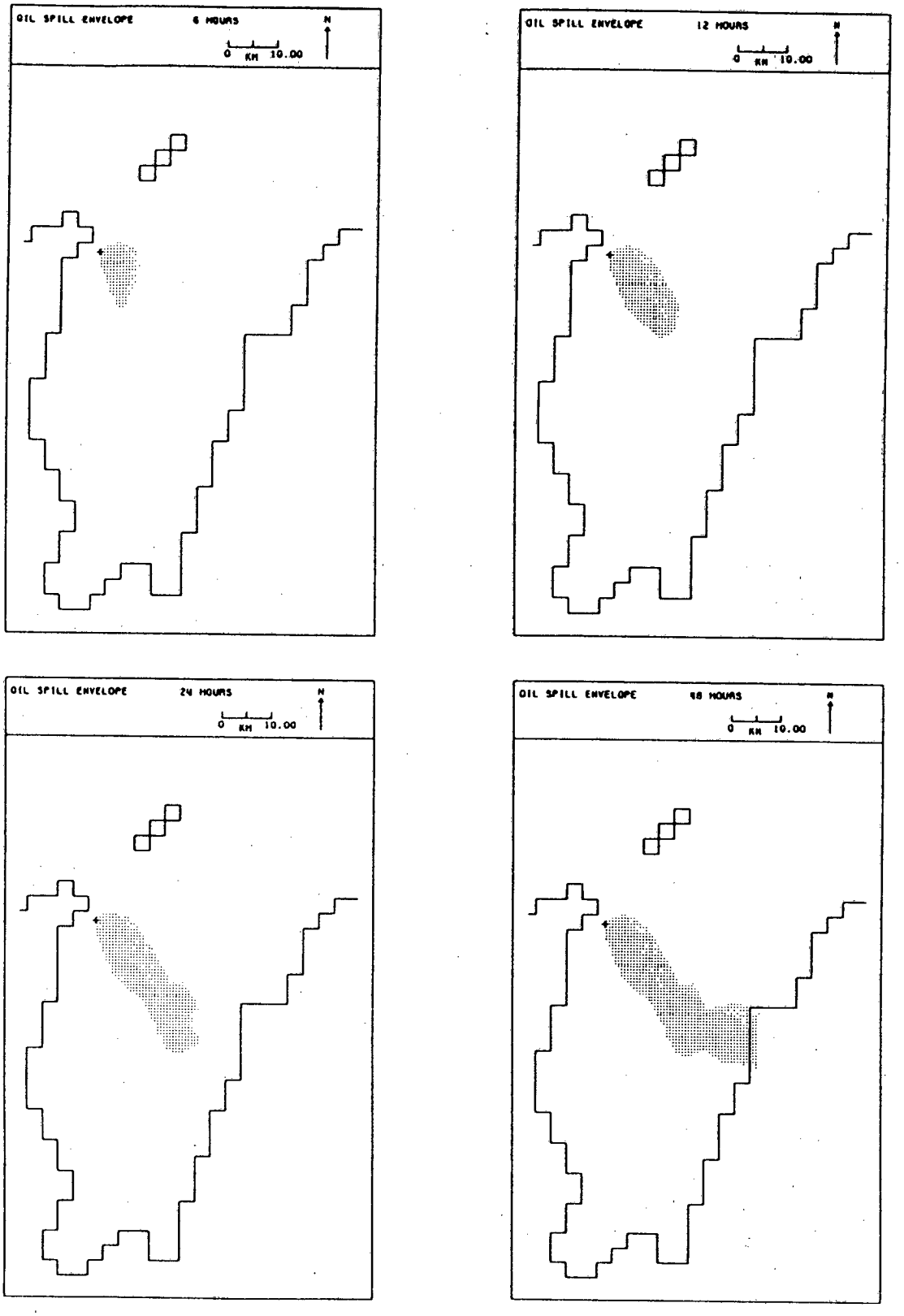


Figure 17 Oil spill envelopes for release times of 6, 12, 24 and 48 hours for the case of a 10 m s^{-1} westerly wind during neap tides for Whalebone Prospect from Steedman Limited.

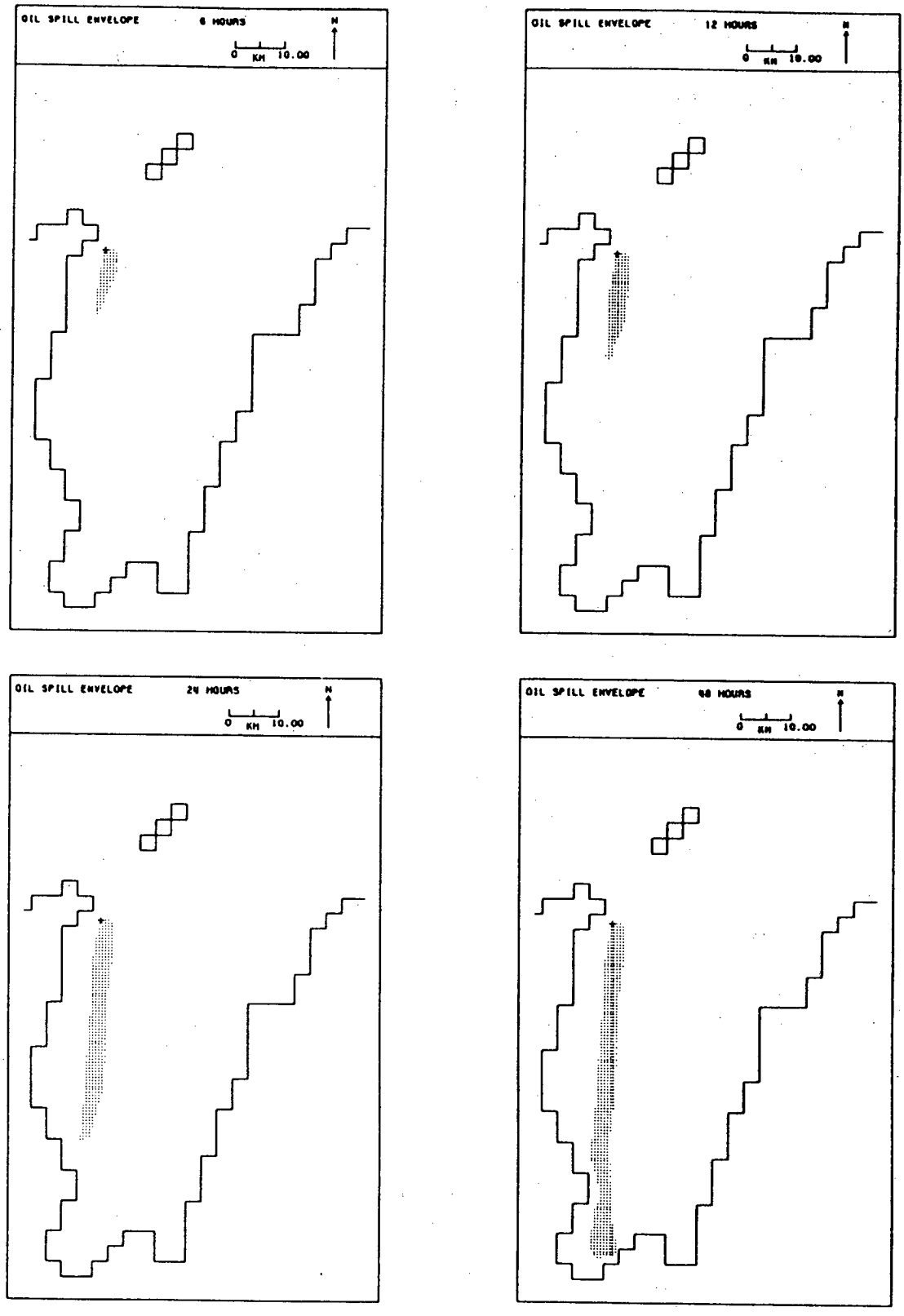


Figure 19 Oil spill envelopes for release times of 6, 12, 24 and 48 hours for the case of a 10 m s^{-1} north-westerly wind during neap tides for Whalebone Prospect from Steedman Limited.

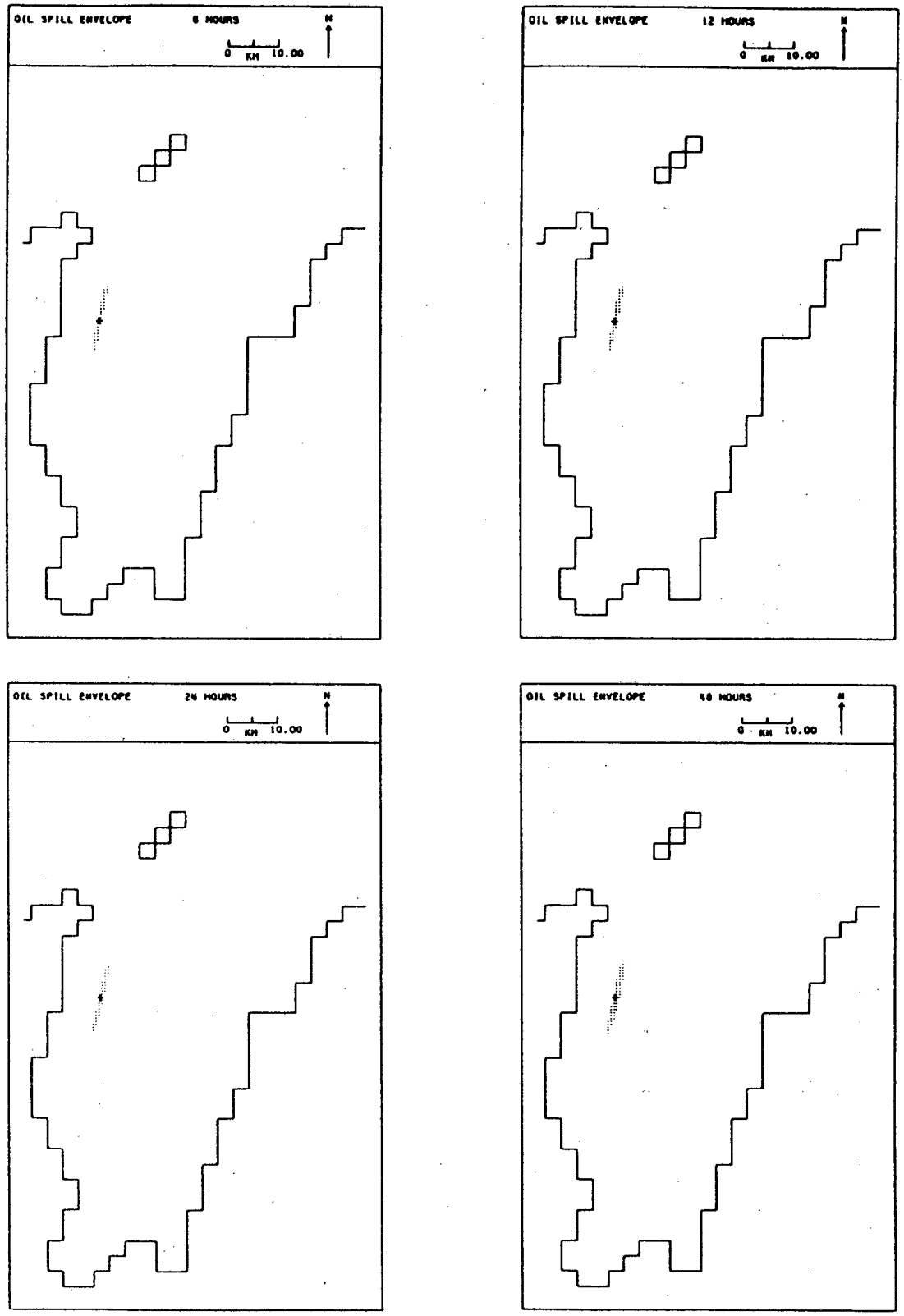


Figure 20 Oil spill envelopes for release times of 6, 12, 24 and 48 hours for the case of spring tides only for Rivoli Prospect from Steedman Limited.

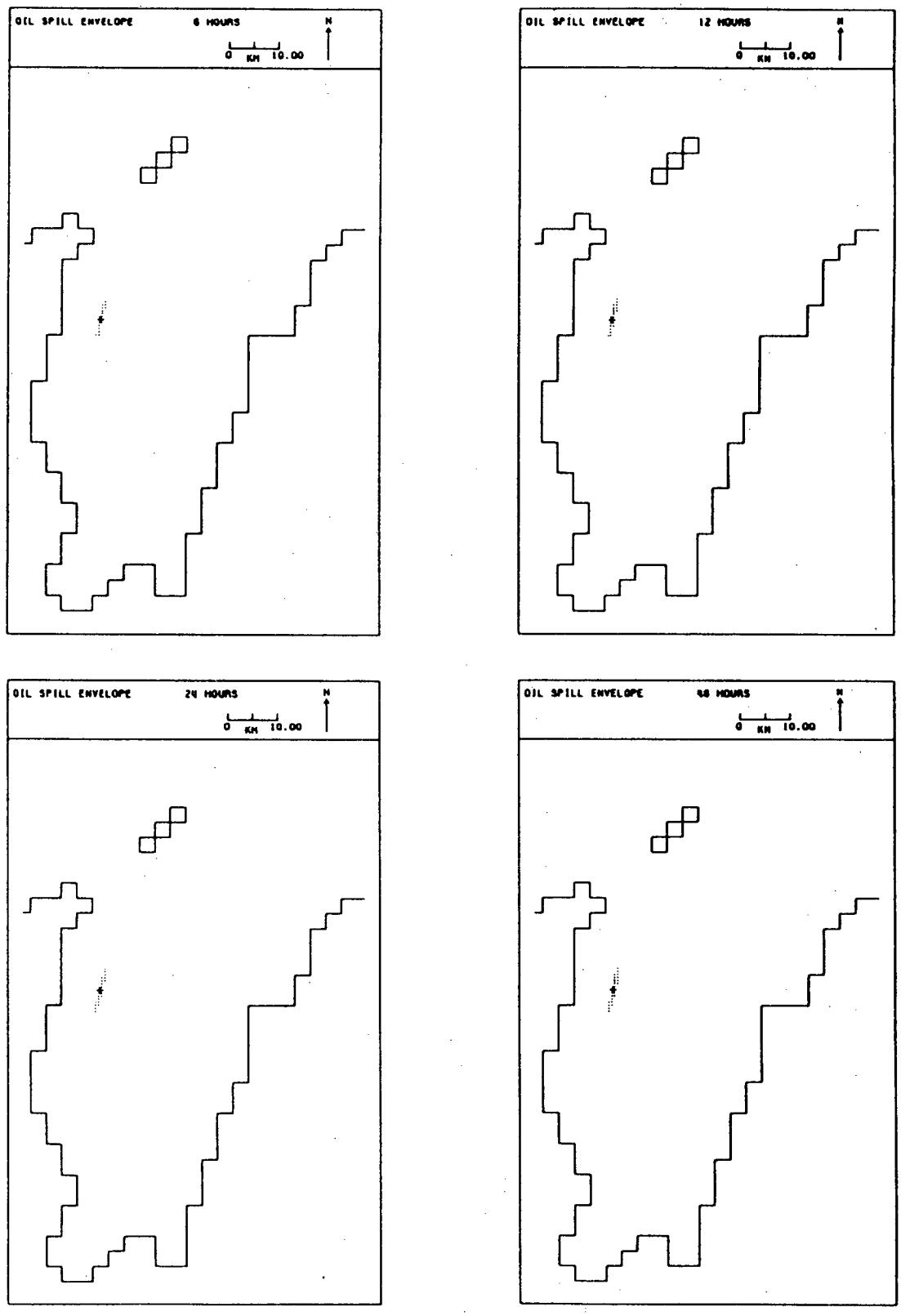


Figure 21 Oil spill envelopes for release times of 6, 12, 24 and 48 hours for the case of neap tides only for Rivoli Prospect from Steedman Limited.

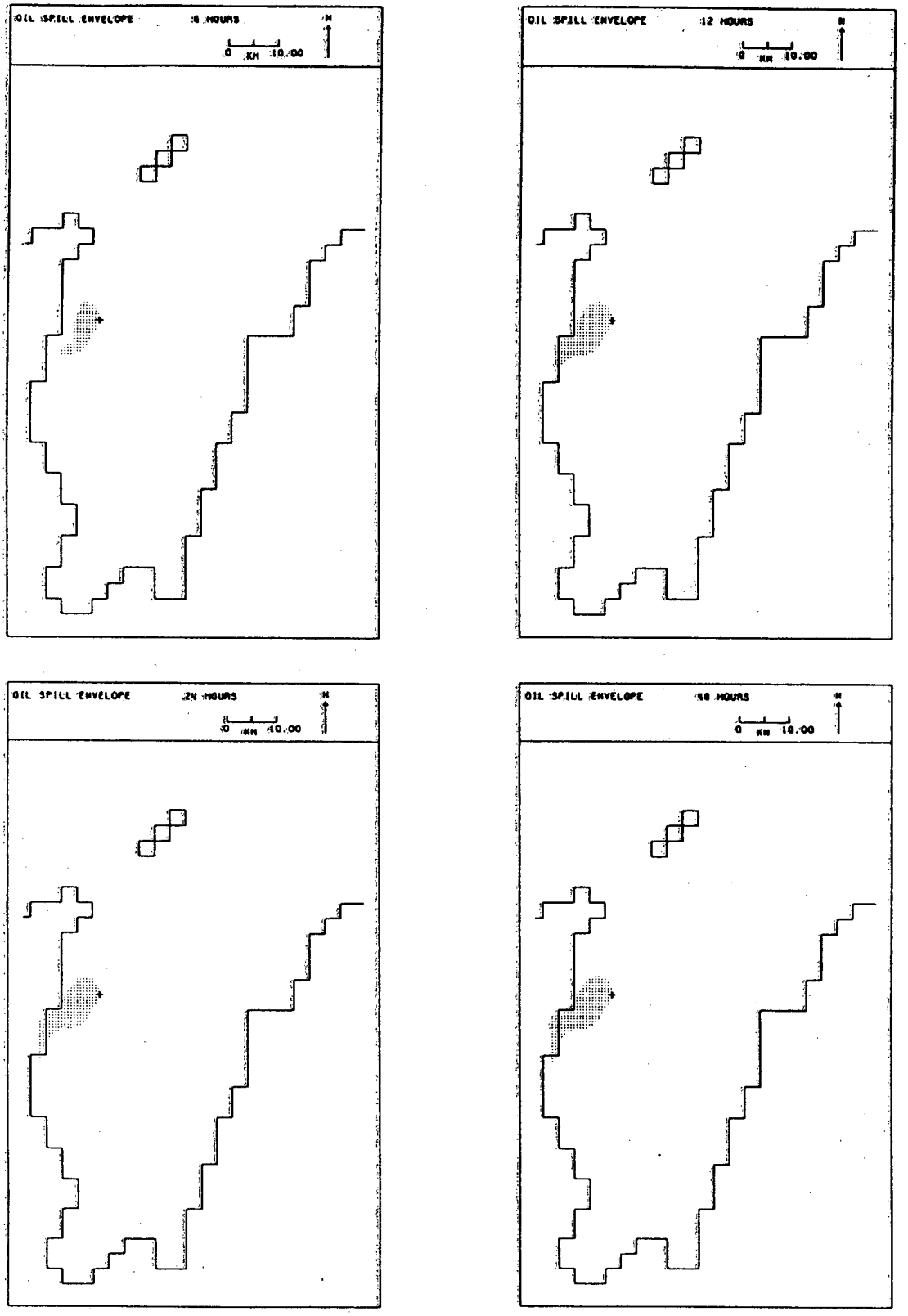


Figure 22 Oil spill envelopes for release times of 6, 12, 24 and 48 hours for the case of a 10 m s^{-1} northerly wind during spring tides for Rivoli Prospect from Steedman Limited.

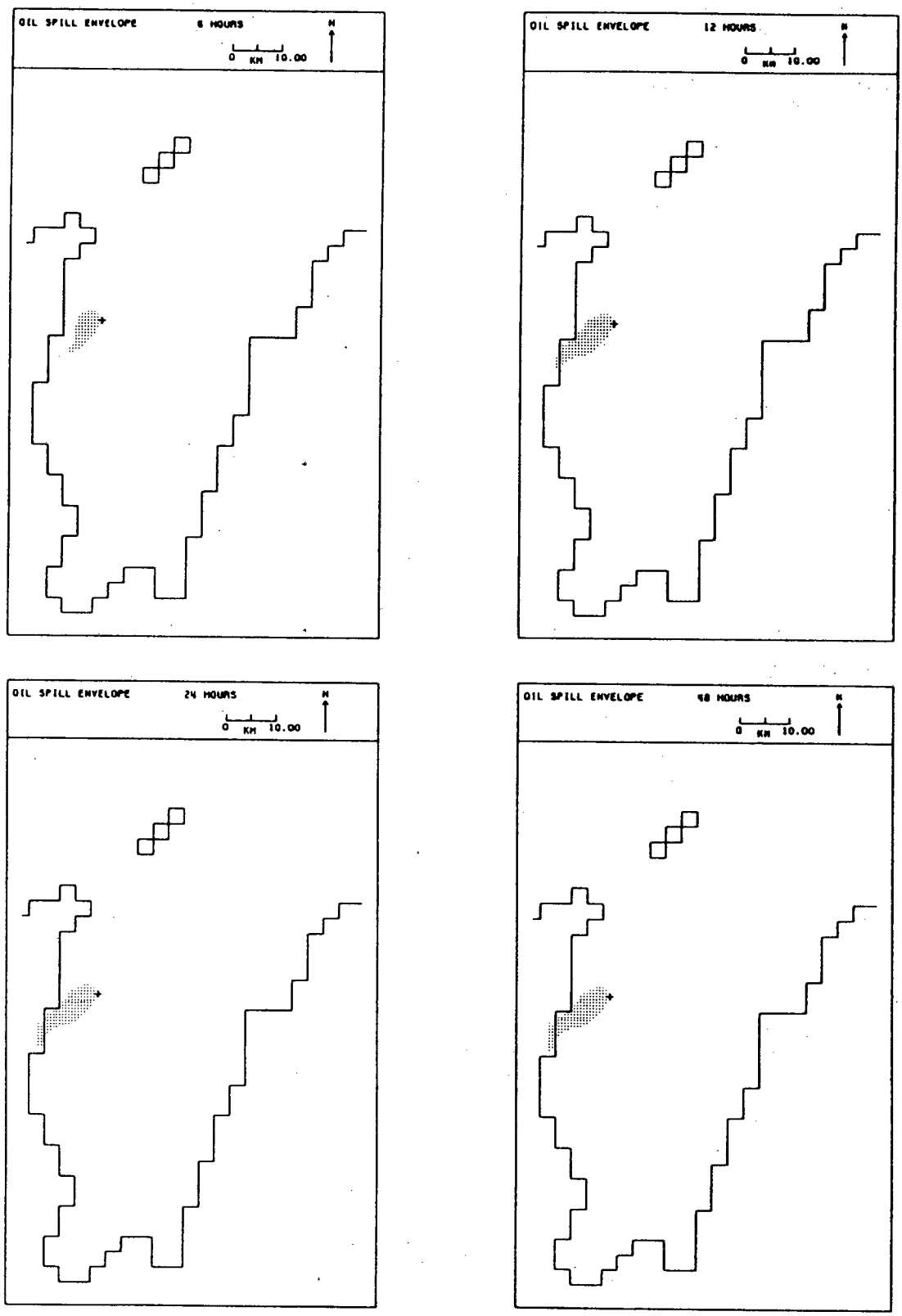


Figure 23 Oil spill envelopes for release times of 6, 12, 24 and 48 hours for the case of a 10 m s^{-1} northerly wind during neap tides for Rivoli Prospect from Steedman Limited.

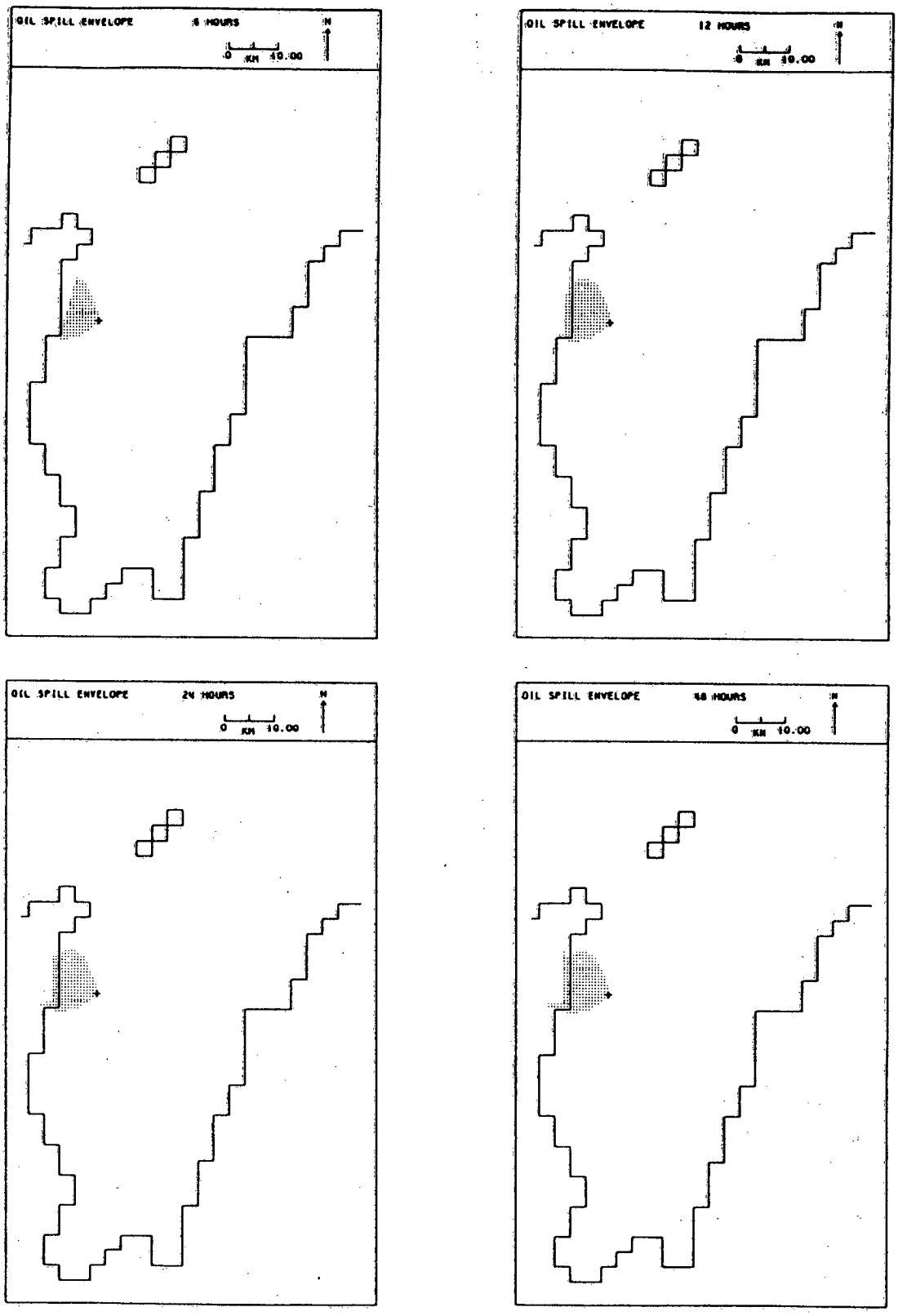


Figure 24 Oil spill envelopes for release times of 6, 12, 24 and 48 hours for the case of a 10 m s^{-1} north-easterly wind during spring tides for Rivoli Prospect from Steedman Limited.

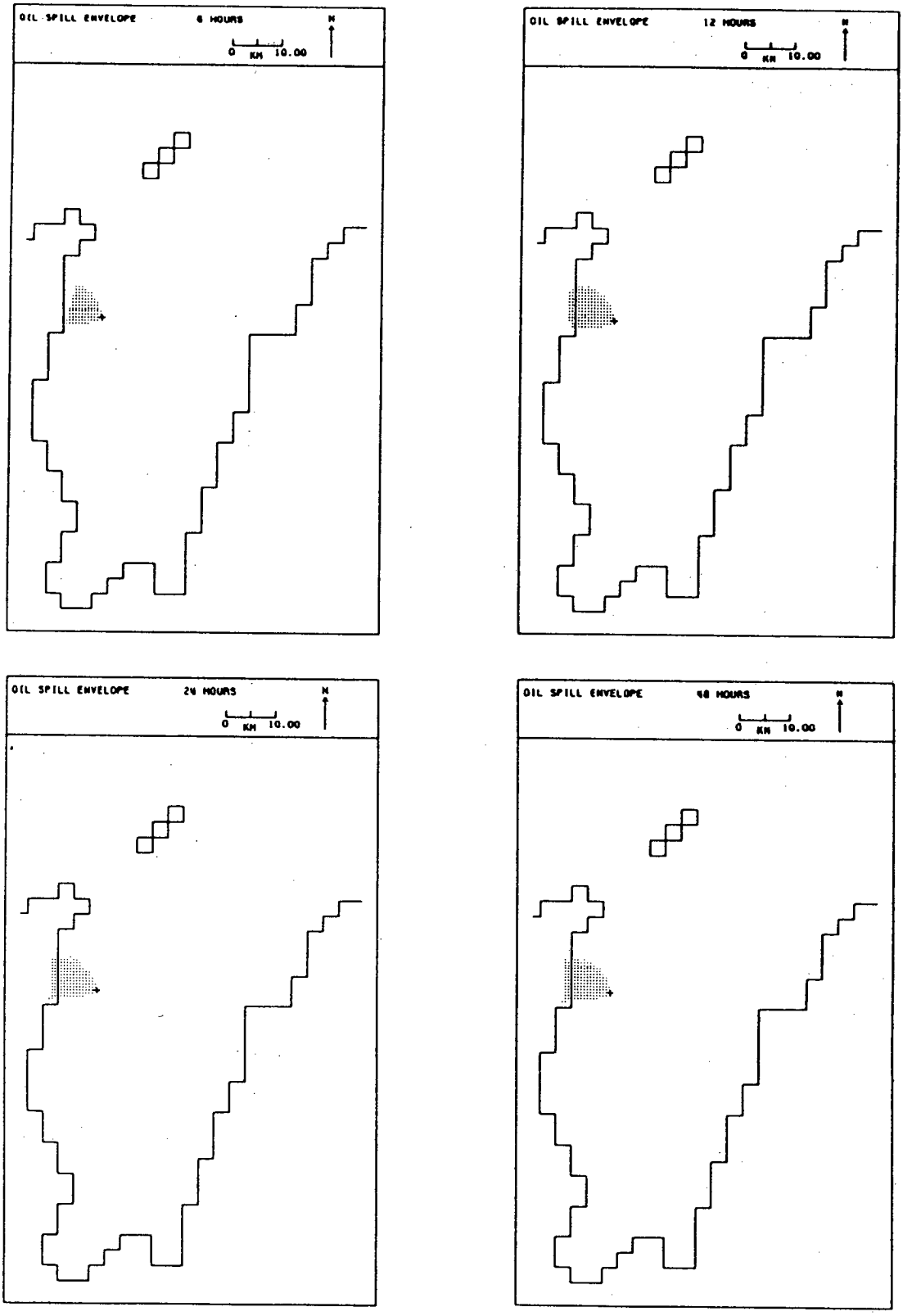


Figure 25 Oil spill envelopes for release times of 6, 12, 24 and 48 hours for the case of a 10 m s^{-1} north-easterly wind during neap tides for Rivoli Prospect from Steedman Limited.

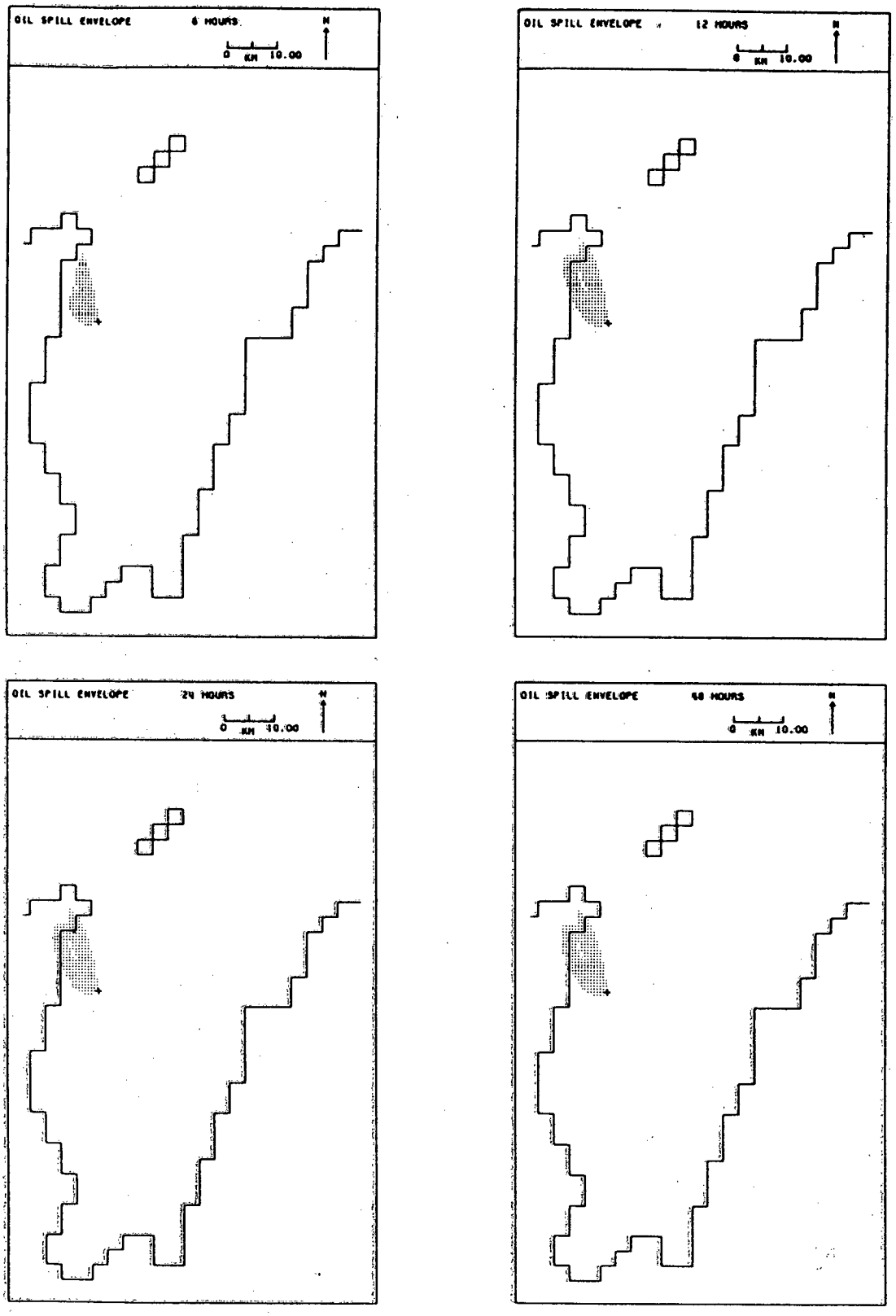


Figure 26 Oil spill envelopes for release times of 6, 12, 24 and 48 hours for the case of a 10 m s^{-1} easterly wind during spring tides for Rivoli Prospect from Steedman Limited.

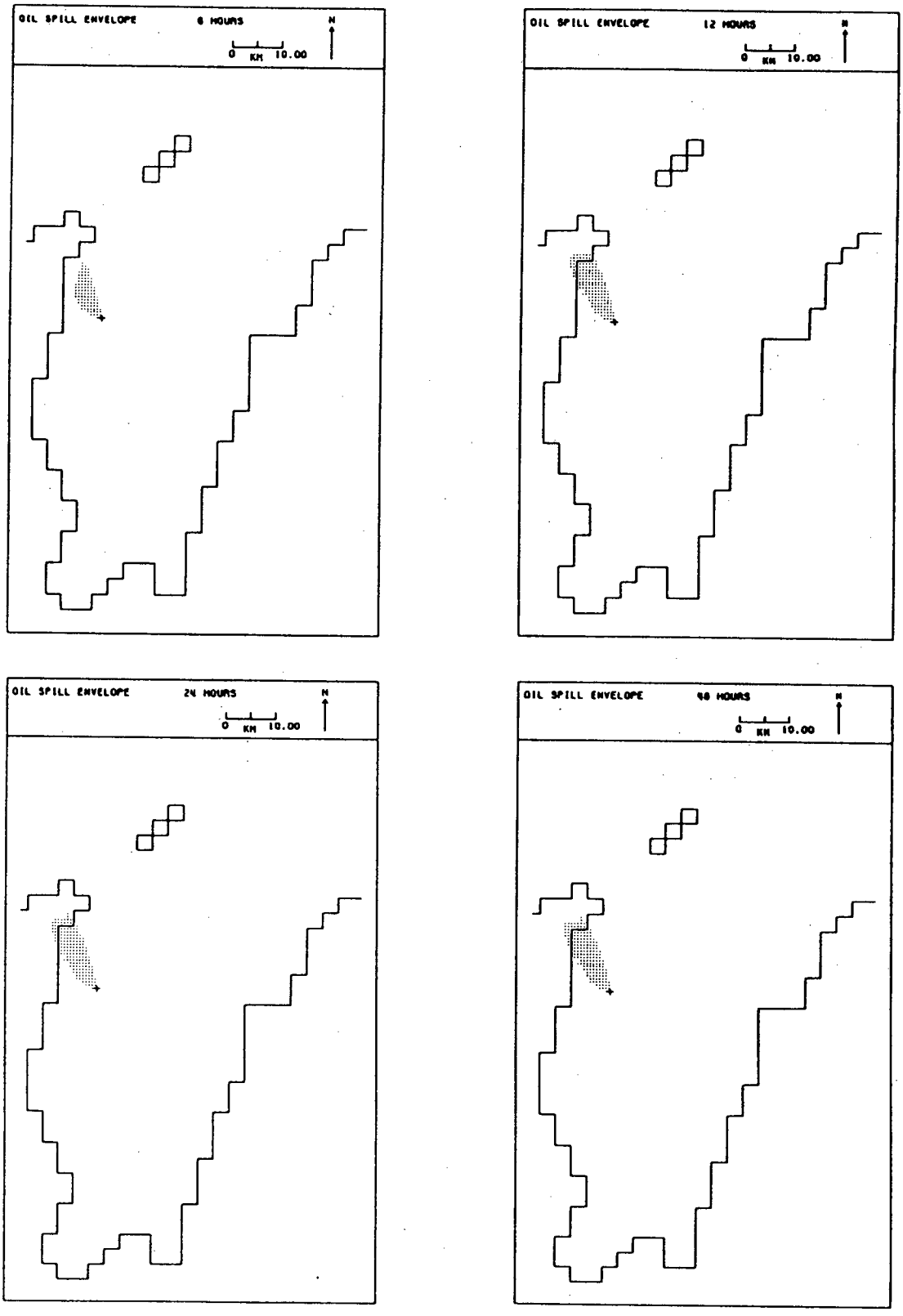


Figure 27 Oil spill envelopes for release times of 6, 12, 24 and 48 hours for the case of a 10 m s^{-1} easterly wind during neap tides for Rivoli Prospect from Steedman Limited.

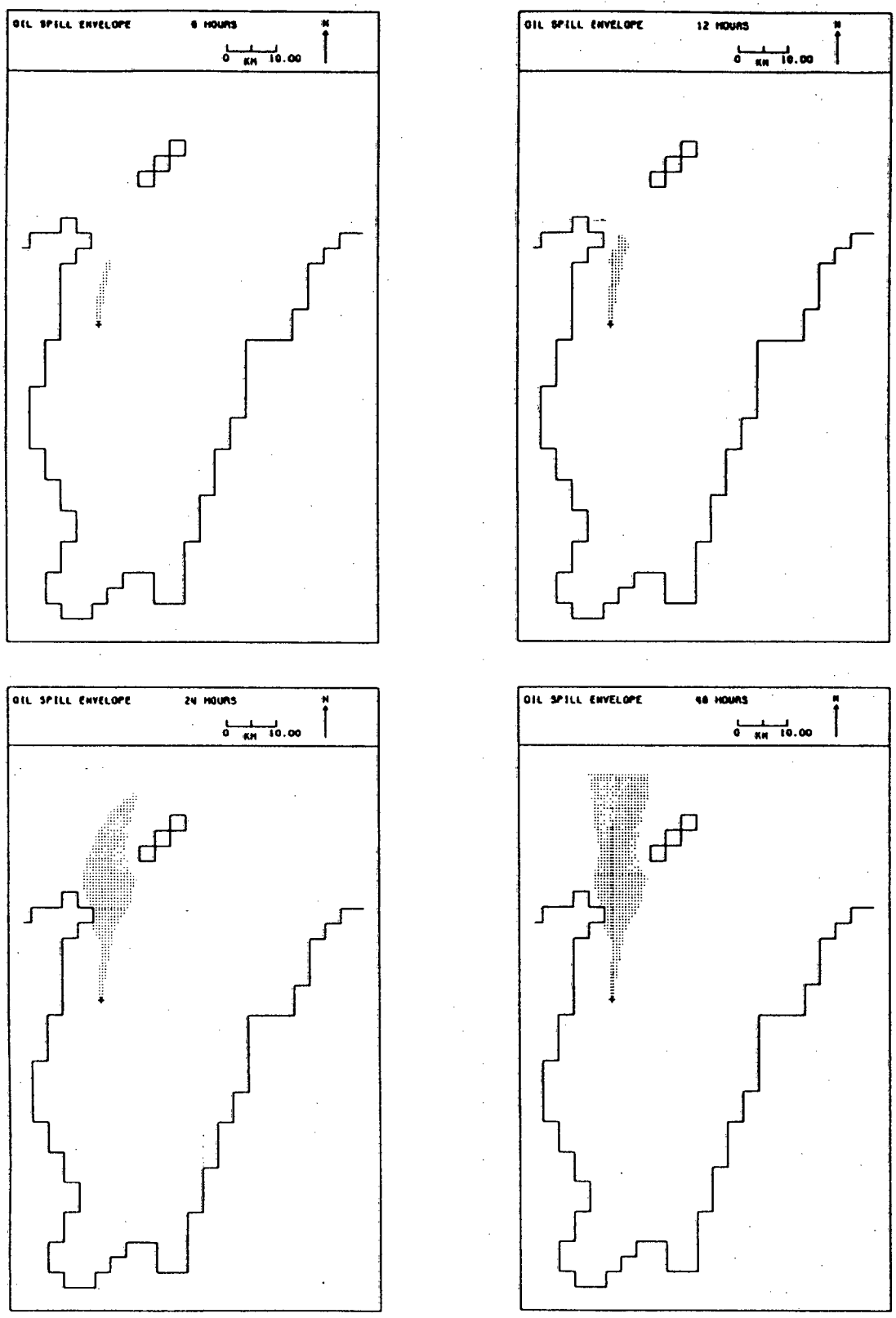


Figure 28 Oil spill envelopes for release times of 6, 12, 24 and 48 hours for the case of a 10 m s^{-1} south-easterly wind during spring tides for Rivoli Prospect from Steedman Limited.

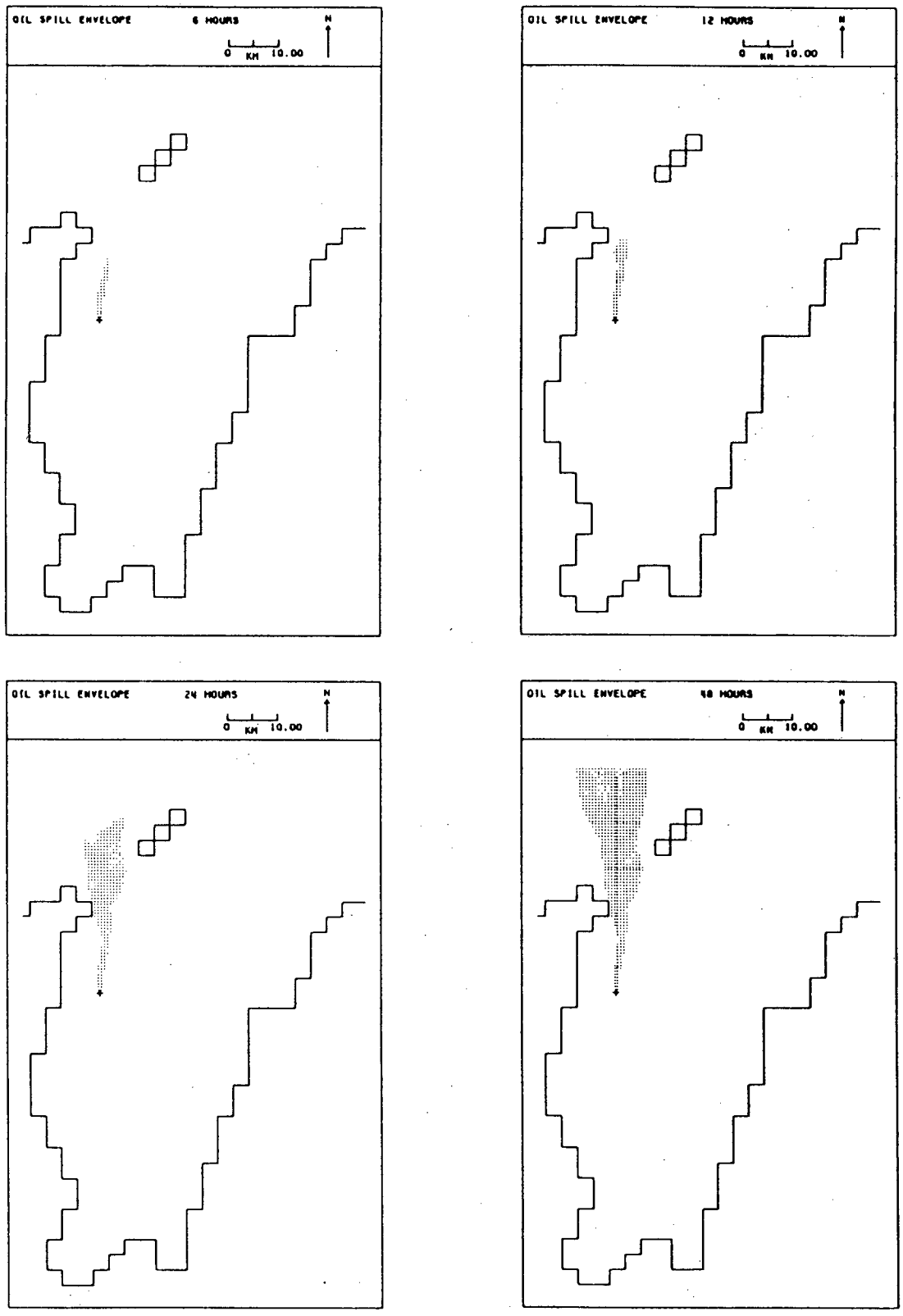


Figure 29 Oil spill envelopes for release times of 6, 12, 24 and 48 hours for the case of a 10 m s^{-1} south-easterly wind during neap tides for Rivoli Prospect from Steedman Limited.

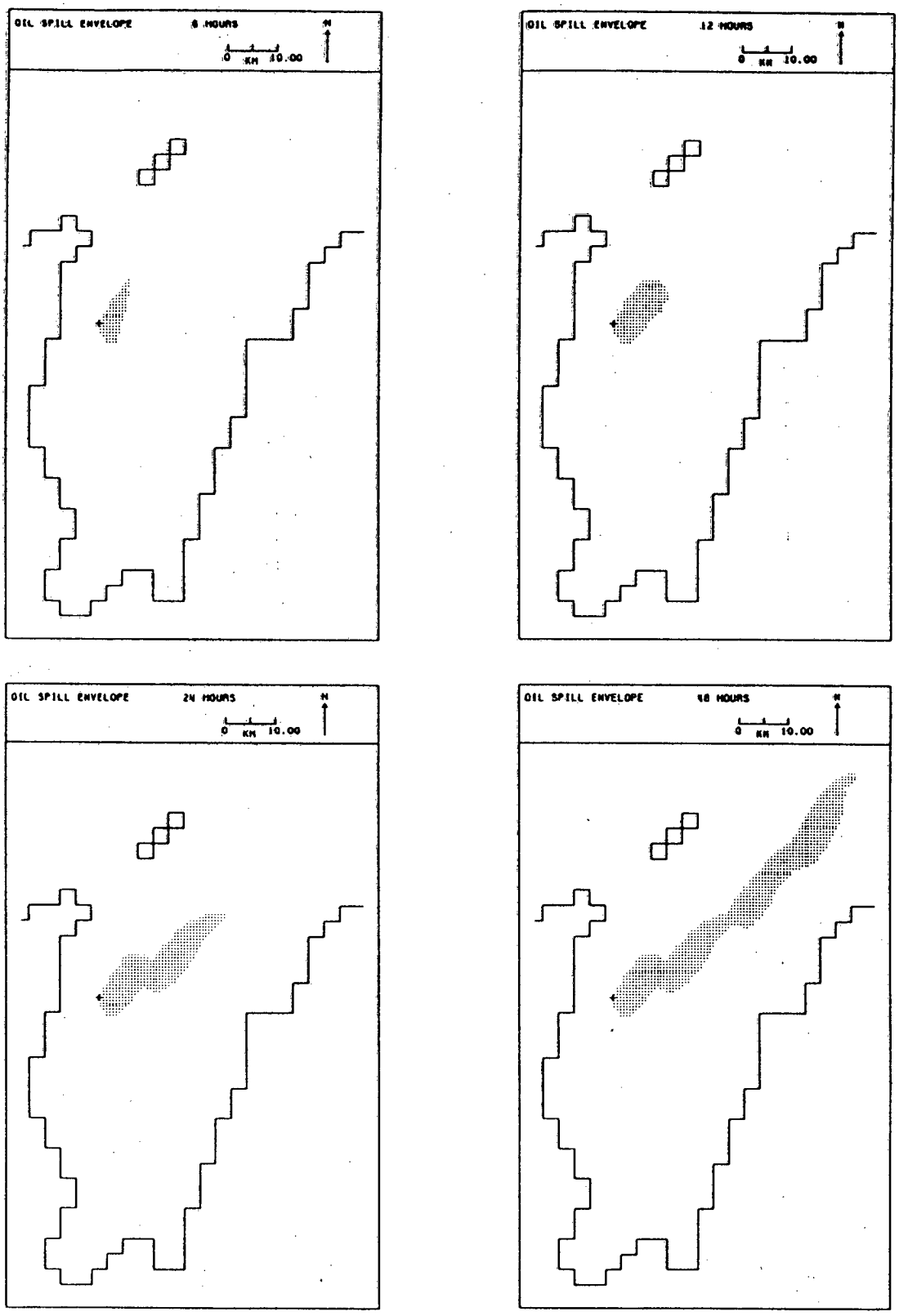


Figure 30 Oil spill envelopes for release times of 6, 12, 24 and 48 hours for the case of a 10 m s^{-1} southerly wind during spring tides for Rivoli Prospect from Steedman Limited.

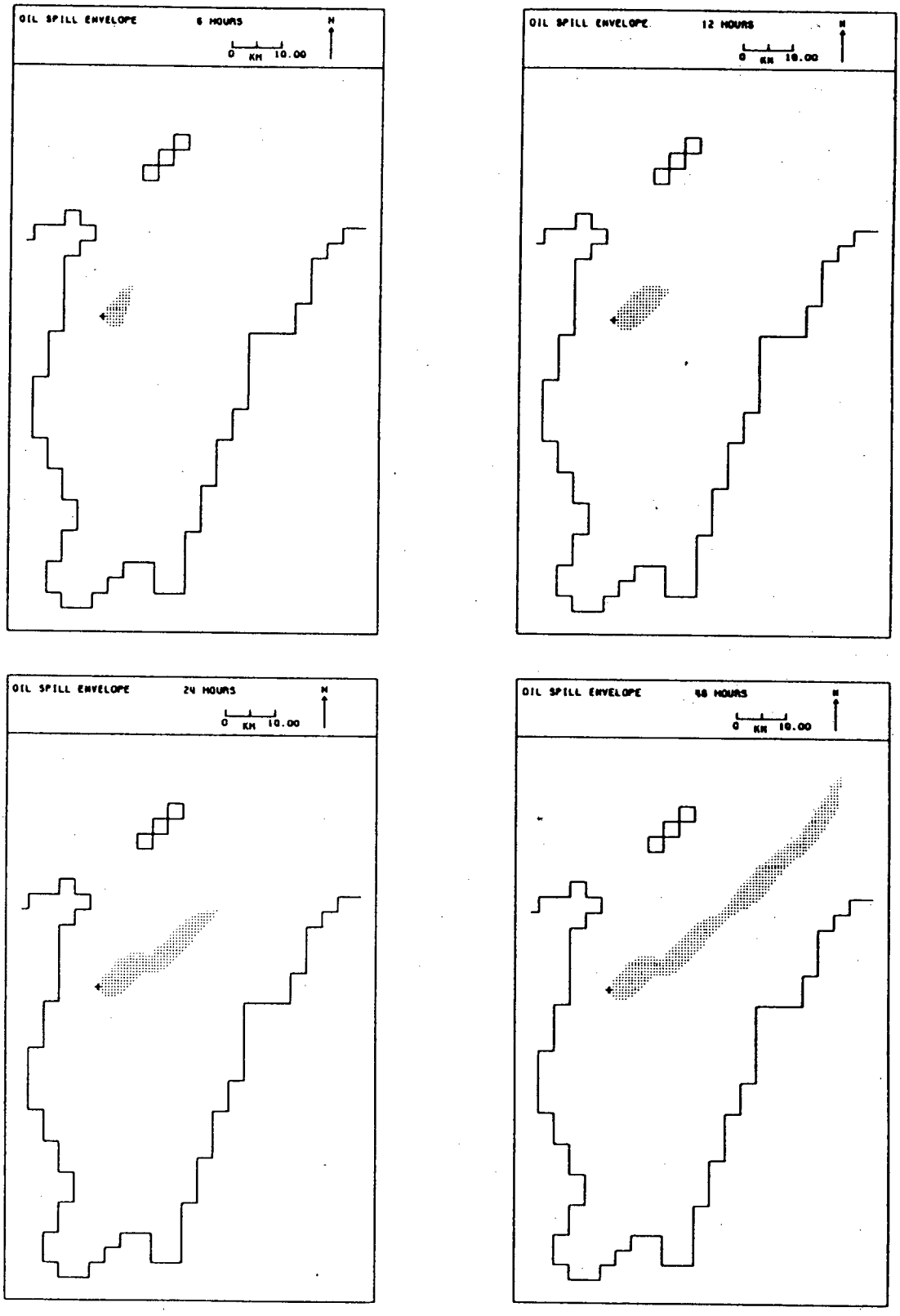


Figure 31 Oil spill envelopes for release times of 6, 12, 24 and 48 hours for the case of a 10 m s^{-1} southerly wind during neap tides for Rivoli Prospect from Steedman Limited.

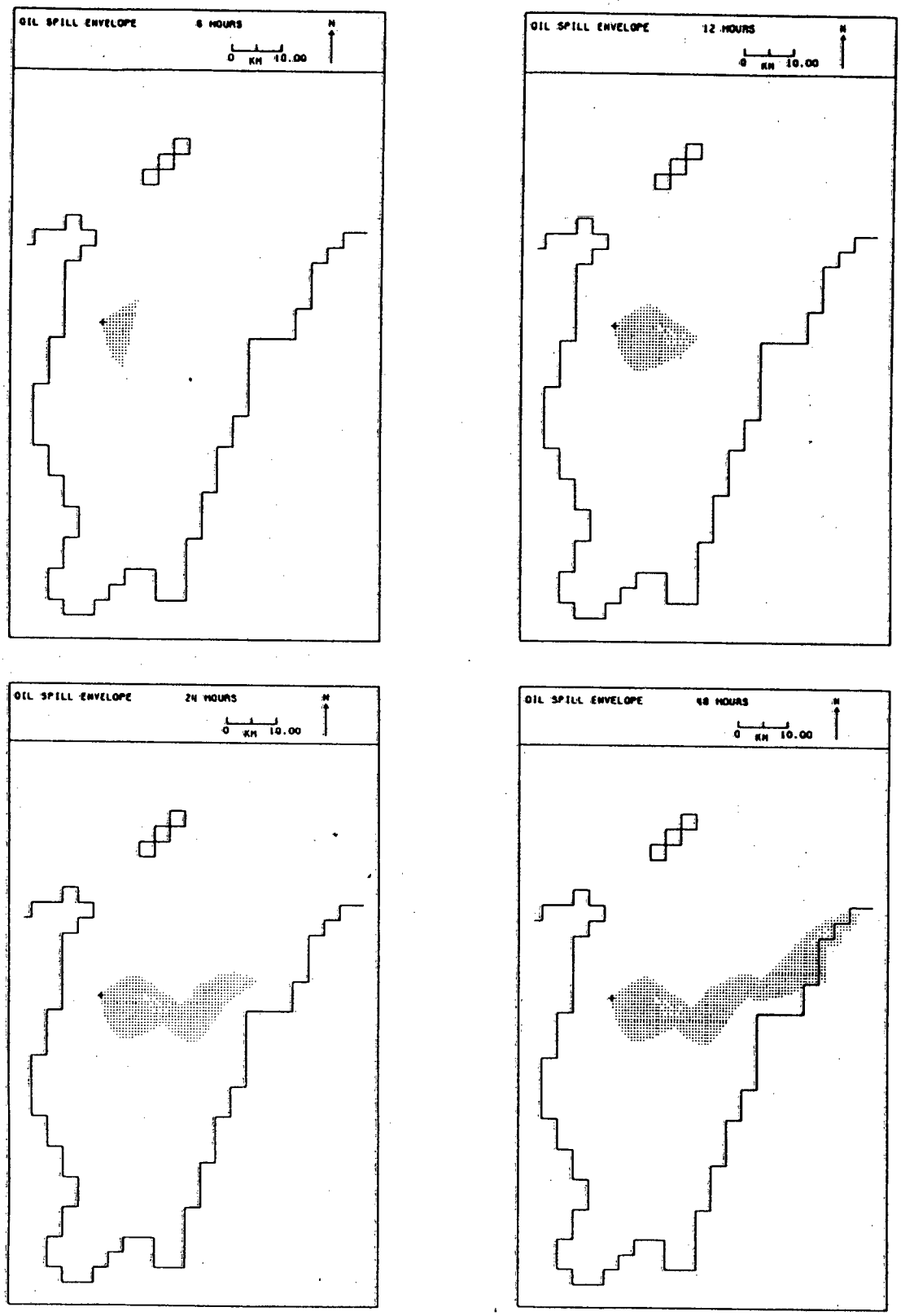


Figure 32 Oil spill envelopes for release times of 6, 12, 24 and 48 hours for the case of a 10 m s^{-1} south-westerly wind during spring tides for Rivoli Prospect from Steedman Limited.

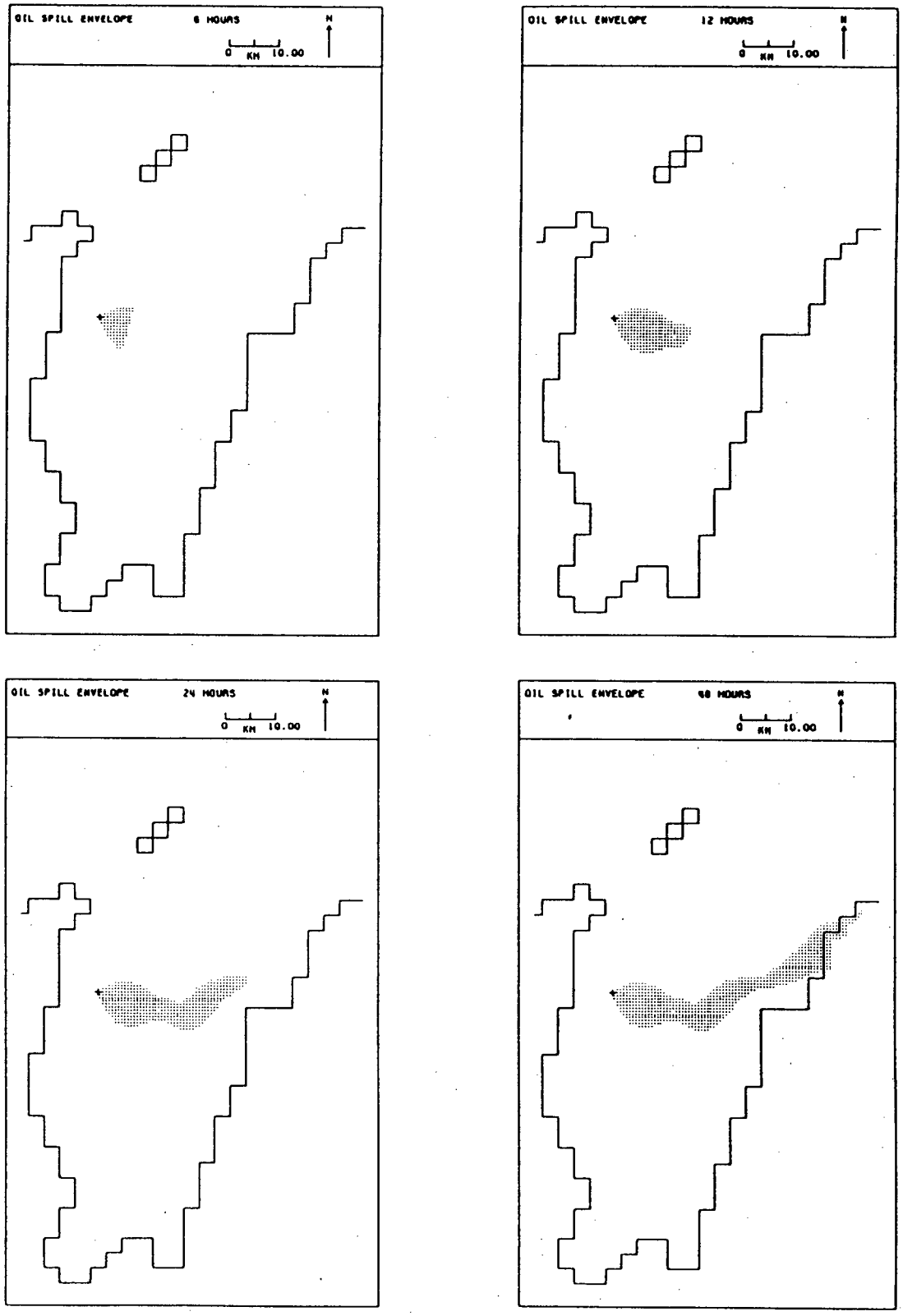


Figure 33 Oil spill envelopes for release times of 6, 12, 24 and 48 hours for the case of a 10 m s^{-1} south-westerly wind during neap tides for Rivoli Prospect from Steedman Limited.

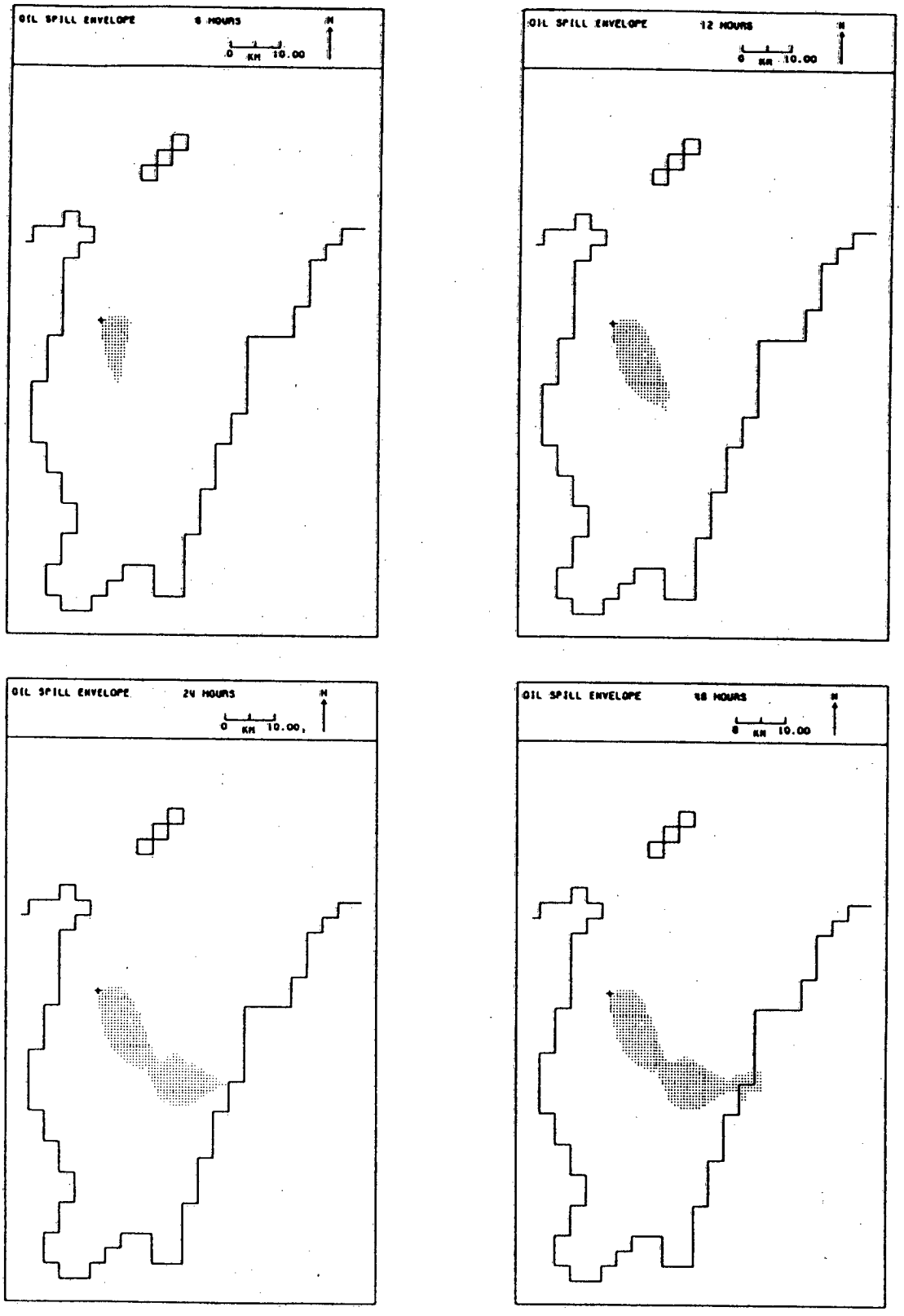


Figure 34 Oil spill envelopes for release times of 6, 12, 24 and 48 hours for the case of a 10 m s^{-1} westerly wind during spring tides for Rivoli Prospect from Steedman Limited.

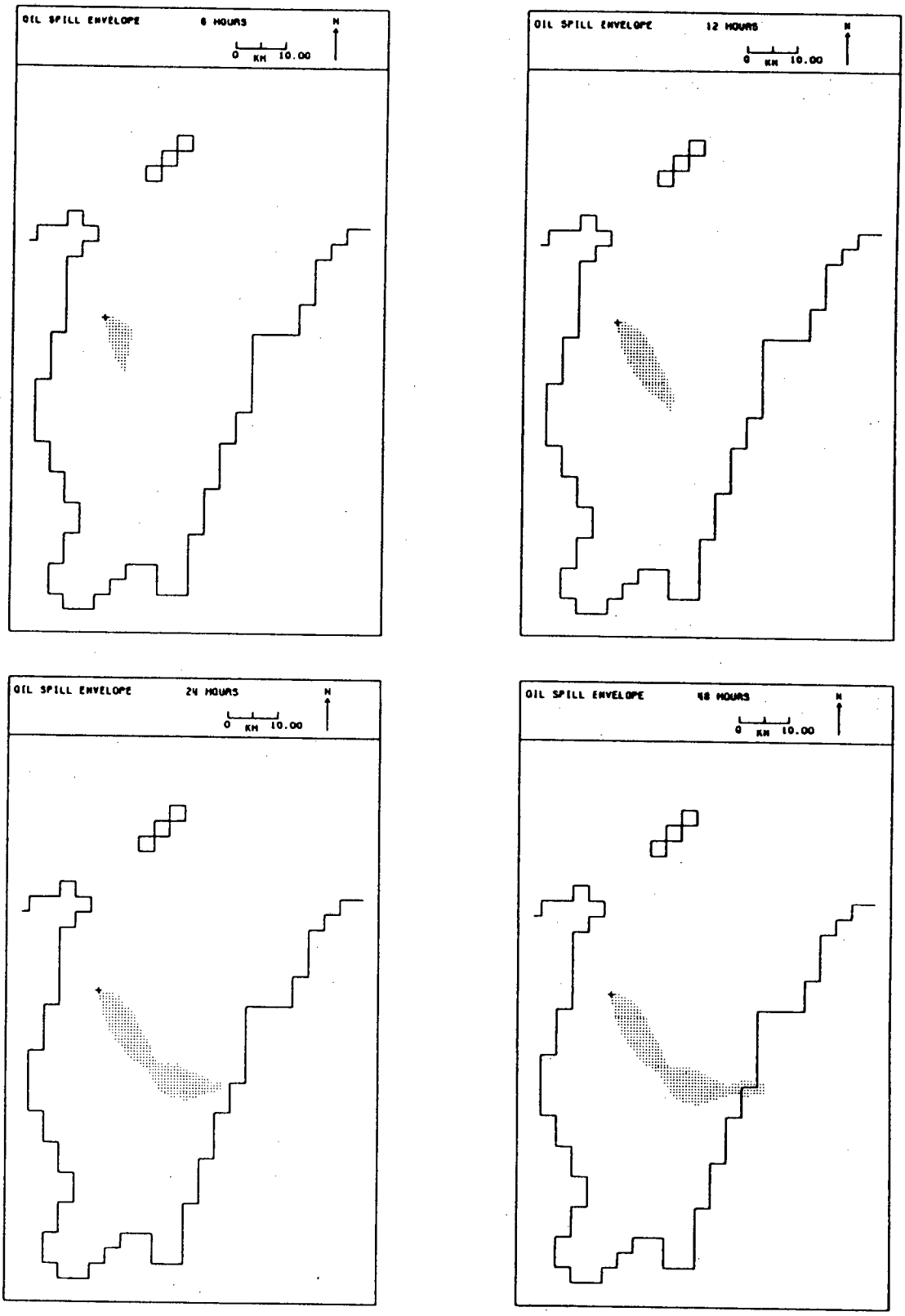


Figure 35 Oil spill envelopes for release times of 6, 12, 24 and 48 hours for the case of a 10 m s^{-1} westerly wind during neap tides for Rivoli Prospect from Steedman Limited.

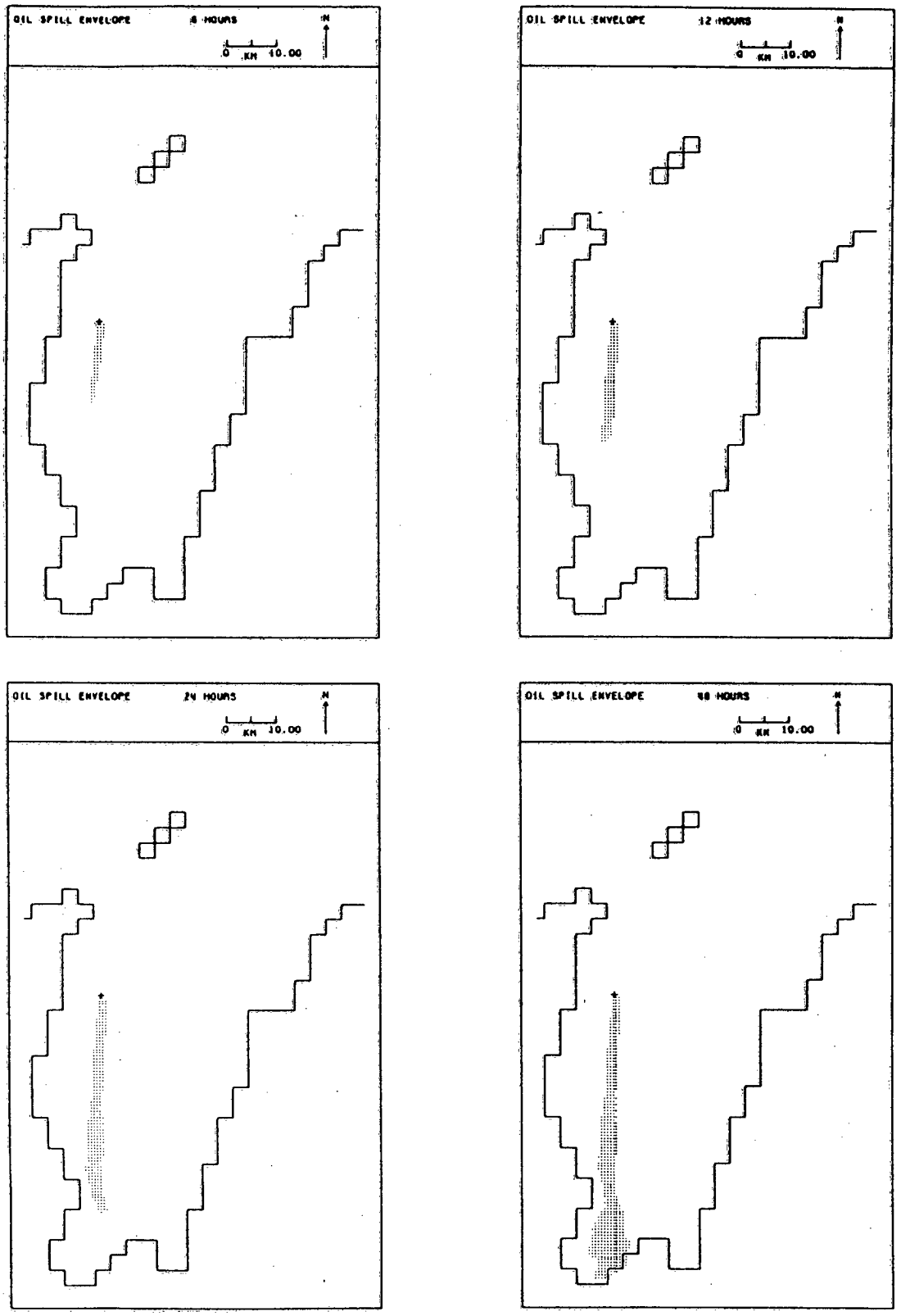


Figure 36 Oil spill envelopes for release times of 6, 12, 24 and 48 hours for the case of a 10 m s^{-1} north-westerly wind during spring tides for Rivoli Prospect from Steedman Limited.

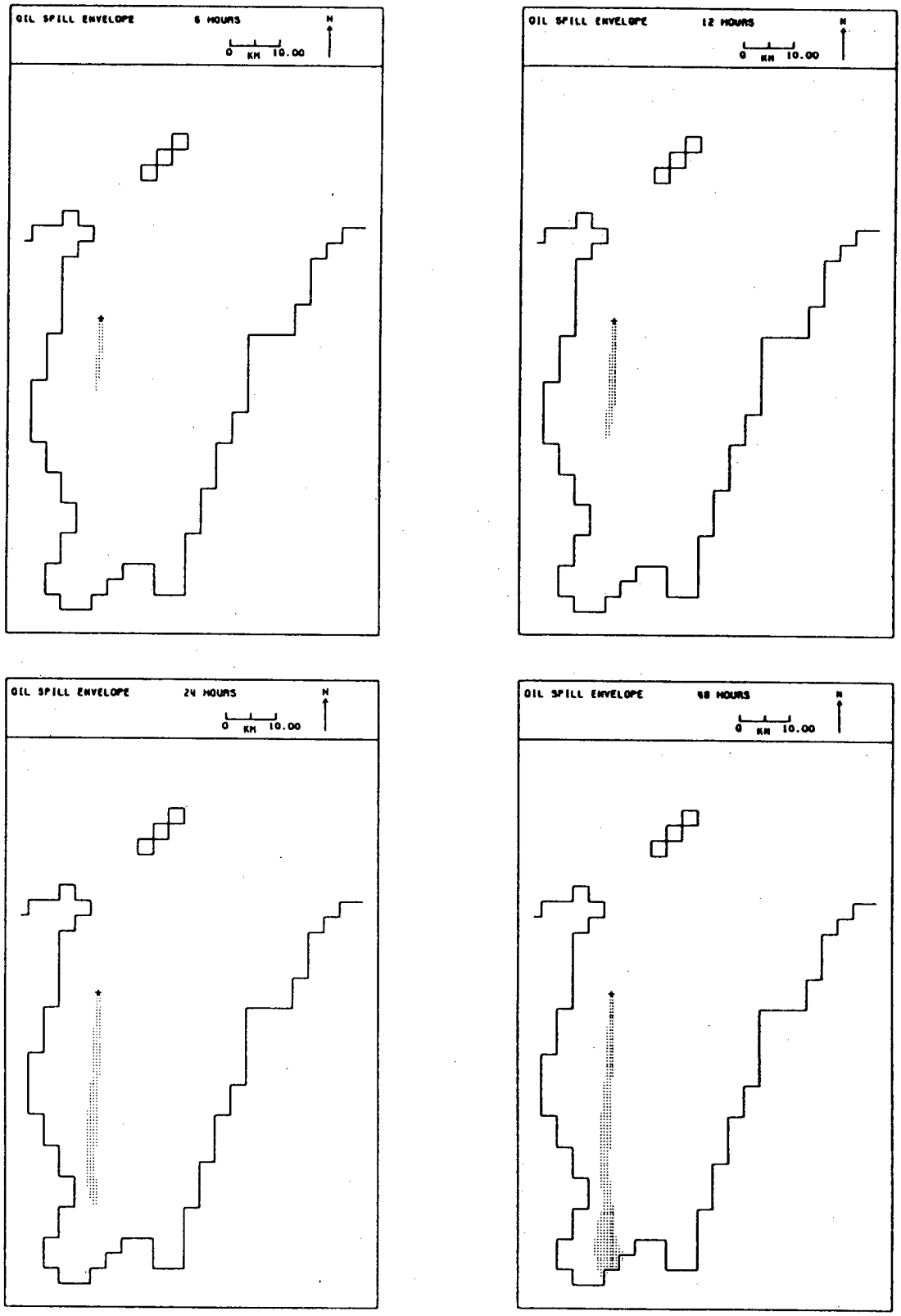


Figure 37 Oil spill envelopes for release times of 6, 12, 24 and 48 hours for the case of a 10 m s^{-1} north-westerly wind during neap tides for Rivoli Prospect from Steedman Limited.

ADDENDUM B

ADDENDUM B

MARINE RESOURCES OF

EXMOUTH GULF

EXPLANATORY NOTE

Selection of an appropriate oil spill control strategy requires information on the resources at risk in the path of the spill, on the sensitivity of those resources to oil and on the recovery rate of those resources subsequent to damage by oil.

Figures 1, 2 and 3 present information on the location of marine resources as follows:

- Figure 1: Coastal geomorphology - the type of shoreline in the region

  This figure is based on Jones (1986). Shoreline Types 1-4 are considered highly sensitive to oil whilst Shoreline Types 5-6 are considered to have moderate to low sensitivity.

- Figure 2: Distribution of marine resources - the location of the range of ecological, commercial, recreational, educational and community resources known to occur in the region (from Jones, 1986).

  The Public Environmental Review (PER) has identified the shallow mud/sand and mangrove flats which border the eastern and southern shores of the gulf as being the most important resource in the region requiring protection.

- Figure 3: Distribution of marine habitats

  The distributions are shown of the range of intertidal and shallow subtidal marine habitats known to occur in the region based on a preliminary field inspection by LSC in 1988. Of the habitats shown, the sandy mud habitat of the shallow subtidal and the extensive intertidal sand/mud flats are the most sensitive to oil and take the longest to recover from oil contamination. The coral reef habitat is also sensitive but only at risk during spring tides. All other habitats are either less sensitive to oil or recover quickly.

The sensitivity to oil and the recovery rates of various tropical marine assemblages are summarised in Tables 1 and 2.

J168

Indian Ocean

Anchor Island

Flat Island

Serrurier Island

North Muiron Island

South Muiron Island

Sunday Island

Locker Island

Observation Island

NORTH WEST CAPE

VLAMING HEAD

POINT MURAT

Reef

JURABI POINT

Ningaloo

EXMOUTH

LOCKER POINT

Fly Island

TUBRIDGI POINT

Brown Island

Eva Island

Y Island

Exmouth Gulf

TENT POINT

Tent Island

Burnside Island

Simpson Island

HOPE POINT

Hope Island

LEARMONTH

HERON POINT

Bay of Rest

POINT LEFROY

Roberts Island

Gales Bay

Doole Island

Giralia Bay

N

0 20km

REFERENCE

Mangrove

1. Broad complex system of tidal channels and flats
2. Limited tidal flat development with some channels, may back onto low cliffs and sand ridges
3. Major tidal creek channels with complex relict sandy beaches, some tidal flat development between headlands
4. Tidal flat development is variable, with some sandy and/or fine-grained beach material, and is controlled by protection from offshore and onshore reefline systems
5. Narrow sandy or silty beach with a high tide range, may be marked by cheniers, beachridges or low cliffs
6. Beachrock and adjacent barrier reefline-formed coast with some beach formation between headlands

LeProvost Semeniuk & Chalmer
Environmental Consultants

Comp: Jones (1986)

Drawn: Environmental

Date: June 1988

Minora Resources N.L.
OIL SPILL CONTINGENCY PLAN

COASTAL GEOMORPHOLOGY

Figure 1

J156

Indian Ocean

Anchor Island

Proposed A Class Reserve (System 9). Important turtle breeding site. Coral reefs.

Nature Reserve – Important nesting areas for Green and Loggerhead turtles. Rich coral reefs.

Flat Island

Serrurier Island

Recreational fishing.

North Muiron Island

Proposed A Class Reserve (System 9). Sea bird colonies.

Sea bird colonies.

Ningaloo Marine Park boundary

South Muiron Island

Sunday Island

Locker Island

Observation Island

Ningaloo Marine Park – from Bundegi Reef round to Amherst Point. Important large, rich coral reefs with sandy beaches, rocky headlands, coral fish, game fish such as Marlin, Mackerel and a variety of reef fauna including tropical rock lobsters.

Nature Reserve.

Rock lobsters, edible oysters and shells.

NORTH WEST CAPE

Diving and surfing.

LOCKER POINT

Diving and spearfishing.

VLAMING HEAD

POINT MURAT

Fly Island

Ningaloo Reef

WHALEBONE PROSPECT

Shells.

TUBRIDGI POINT

JURABI POINT

Important nesting areas for Green turtle

Sea bird feeding area and prawn nursery area.

Brown Island

Important fishery for King, Tiger and Endeavour prawns.

Eva Island

EXMOUTH

Y Island

Exmouth Gulf

RIVOLI PROSPECT

Exmouth Yacht Club, boats, shells and fishing.

TENT POINT

Tent Island

3 species of mangroves at Mangrove Bay, at least 13 crab species.

Important fishery for King, Tiger and Endeavour prawns.

Burnside Island

Prawn factory.

Proposed A Class Reserve (System 9).

Simpson Island

Proposed A Class Reserve (System 9). Sea bird colonies.

Turtles.

HOPE POINT

Hope Island

Museum crab research area. Rich echinoderm fauna, molluscs, type locality for certain crustaceans.

Dugongs.

Sea bird feeding area and prawn nursery area.

LEARMONTH

HERON POINT

Dugong concentrations and turtles.

Bay of Rest

Mangroves.

POINT LEFROY

Giralia Bay pearl culture.

Roberts Island

Gales Bay

Gales Bay pearl culture.

Giralia Bay

Doole Island

Mangroves.

Biological and sedimentological surveys recommended for tidal and supratidal flats from Exmouth Gulf to Mary Anne Islands (System 9). Fish and prawn nursery area. Marine nutrients supply area, mangroves, algal mats and flats.

N

0 20km

LeProvost Semeniuk & Chalmer Environmental Consultants

Comp: Jones (1986)
Drawn: Environmental
Date: June 1988

Minora Resources N.L.
OIL SPILL CONTINGENCY PLAN

MARINE RESOURCES

Figure 2

J156

Indian Ocean

Anchor (Bessieres) Island

Flat Island

Serrurier (Long) Island

North Muiron Island

South Muiron Island

Sunday Island

Locker Island

Observation Island

NORTH WEST CAPE

VLAMING HEAD

POINT MURAT

Ningaloo Reef

JURABI POINT

WHALEBONE PROSPECT

Bundegi Reef

Exmouth

EXMOUTH

RIVOLI PROSPECT

Murat Road

Gulf

LEARMONTH

HERON POINT

Bay of Rest

POINT LEFROY

Roberts Island

Gales Bay

Doole Island

SANDALWOOD PENINSULA

Giralia Bay

Learmonth – Minilya Road

LOCKER POINT

Fly Island

TUBRIDGI POINT

Brown Island

Eva Island

Island

TENT POINT

Tent Island

Burnside Island

Simpson Island

HOPE POINT

Hope Island

N

0 20km

REFERENCE

INTERTIDAL

- Rocky shore
- Sandy beach
- Sand / mud flats

INTERTIDAL AND SHALLOW SUBTIDAL

- Limestone pavement

SUBTIDAL

- Coral reef
- Sand
- Sand / mud flats

LePrevost Semeniuk & Chalmer Environmental Consultants

Comp: P. Collins

Drawn: Environmental

Date: June 1988

Minora Resources N.L.

OIL SPILL CONTINGENCY PLAN

NEARSHORE MARINE HABITATS

Figure 3

TABLE A/B-1

A SUMMARY OF EFFECTS OF OIL IN TROPICAL MARINE ENVIRONMENTS

Community or Population Type	Damage and Type of Effect	Recovery Rates Following Damage	Relative Sensitivity To Oil
Coral Reefs	Susceptible to damage from oil, drilling muds & dispersants. Effects range from mortality to abnormal responses and reduced growth and reproductive processes.	Behavioural effects temporary.Recovery rates poorly known. Recolonisation of oiled areas is delayed.	Sensitive
Seagrass Beds	Some species show short-term local damage. Severe damage to intertidal organisms as a result of oil and dispersant. Epifaunal communities suffer damage.	Recovery may be rapid after minor damage. Retention of oil in sediments may cause long-term problems.	Sensitive
Mangroves	Highly susceptible to even light oiling resulting in defoliation & death. Faunal mortalities leading to decrease in population density.	Recovery is slow. Estimates from 10's-100's of years to attain a mature forest. Retention of oil in sediments may cause long-term problems.	Very Sensitive
Intertidal mud sand flats	Rich flora and fauna, includes seagrass beds, mangroves, spawning and nursery grounds. Many plants and animals may be killed if oil penetrates the sediments or covers the mud surface. Bird and fish feeding impacted.	Vary from rapid (mo/yr) to slow (10's of yrs) depending on degree of oil retention and availability of recolonising species.	Sensitive
Seagrass flats	Susceptible to oiling, leads to death, denuding of area.	Recovery rapid, within 12 months.	Sensitive

TABLE A/B-1 (cont'd)

Community or Population Type	Damage and Type of Effect	Recovery Rates Following Damage	Relative Sensitivity To Oil
Rocky Intertidal	Little effect, organisms hardy. Damage done by coating leading to suffocation or loss of purchase on substrate.	Fast recovery. Return of species with mobility.	Low Sensitivity
Seabed Sediments	Vary from severe macrofaunal depletion to subtle disturbances to community structure. Increase in abundance of opportunist species may occur. Offshore oilfields may produce a distinct zone of effect, usually restricted to within 1000m of platform.	May form a sink for pollutants. Largely unknown, persistence will depend on degree of retention of oil.	Sensitive oil may reach them slowly
Open Waters	Surface dwelling organisms may suffer (birds, mammals, plankton, neuston). Lethal and sublethal effects on fish by oil & flesh tainting occurs.	Unknown. Local breeding populations of larval fish & shellfish may take longer to recover. Plankton should recover rapidly.	Some components sensitive
Benthic Communities	Mortalities lead to decrease in population density & age distributions. Change in species abundance and distribution, imbalance between interacting populations.	Immigration from surrounding areas should speed up recovery.	Some components sensitive
Birds	Very easily damaged, oiling of plumage and ingestion of oil result in large mortalities.	Damage to breeding population will cause slow recovery.	Very sensitive

TABLE A/B-1 (cont'd)

Community or Population Type	Damage and Type of Effect	Recovery Rates Following Damage	Relative Sensitivity To Oil
Fish	Possible to avoid spills. Greatest danger to local breeding populations in confined waterways or benthic fish in heavily polluted substrates.	Fast to moderate recovery rates. Fast immigration of larvae and adults.	Moderate sensitivity
Mammals	Chances of impact reduced by low abundance of mammals and ability to escape the area impacted. Conclusive evidence of death due to oil is rare Possible effects include ingestion of oil during grooming, loss of thermal insulation and/or water-proofing and eye irritation.	Slow if population is seriously affected.	Unknown

Sources: Dicks (1984)
Hyland & Schneider (1977)

TABLE A/B-2

SUMMARY OF COASTAL SHORELINE SYSTEMS IN ORDER OF INCREASING VULNERABILITY TO OIL SPILL DAMAGE

Vulnerability Index	Shoreline Type	Comments
1	Exposed rocky headlands	Wave reflection keeps most of the oil offshore.
2	Eroding wave-cut platforms	Wave swept. Most oil removed by natural processes within weeks.
3	Fine-grained sand beaches	Oil does not penetrate into the sediment.
4	Coarse grained sand beaches	Oil does not sink in and/or become buried rapidly. Under moderate to high energy conditions oil will be removed naturally from the beach face within months.
5	Exposed, compacted tidal flats	Most oil will not adhere to, or penetrate into, the compacted tidal flat.
6	Mixed sand and gravel beaches	Oil may undergo rapid penetration and burial. Oil may persist for years under moderate to low energy conditions unless physically removed.
7	Gravel beaches	Same as above. Clean-up should concentrate on the high-tide swash area.
8	Sheltered rocky coasts	Areas of reduced wave action. Oil may persist for many years if not physically removed.
9	Sheltered tidal	Areas of great biologic activity and low wave energy. Oil will persist for years if not physically removed.
10	Salt marshes and mangroves	Most productive of aquatic environments. Oil may persist for years if not physically removed.

Source: IMCO/UNEP (1982)

ADDENDUM C

ADDENDUM C

EMERGENCY TELEPHONE LISTING

(STD area code is 09 - unless otherwise noted)

COMPANY PERSONNEL	OFFICE	RESIDENCE
Minora Resources NL		
G.M. Edmond (Managing Director)	325 3188	386 4569
J.B. McElhinney (Drilling Manager)	325 3188	450 5429
I. LeProvost (Environmental Advisor)	381 7400	330 6247
STATE DEPARTMENTS		
Mines		
D.R. Kelly (Director General of Mines)	222 3333	385 9948
D. Schonhut (Director Petroleum Division)	222 3291	457 8896
Marine and Harbours		
Capt. W. Spencer	335 0888	364 4949
Capt. D. Oliver	335 0888	528 2584
Fisheries		
Dr H. Jones	447 1366	341 6510
Dr J. Edmonds	447 1366	447 3635
Conservation and Land Management		
Environmental Protection Branch, Como		
F. Batini	367 0333	457 1952
N. Caporn	367 0333	386 5683
Wildlife Protection, Como		
D. Mell	367 0333	448 1109
D. Coughran	367 0333	401 8183
P. Pennings	367 0333	332 6368
Exmouth		
District Manager	(099) 491676	(099) 491604
Marine Park Manager	(099) 491676	
Ranger in Charge	(099) 491676	(099) 491428

STATE DEPARTMENTS	OFFICE	RESIDENCE
Conservation and Land Management		
Geraldton Regional Office		
G. Mercer	(099) 215955	(099) 218020
Environmental Protection Authority		
D. Gordon (Statewide)	222 7063	448 4554
P. Ashton (Fremantle)	419 5500	351 8816
FEDERAL AUTHORITIES		
Department of Transport		
Capt. D. Clarke (Director Surface)	323 1700	383 1594
Mr E. Twigg	430 1301	364 6429
Brambles Manford - Port Hedland		
K. Welk	(091) 731855	(091) 731165
T. Odjers	(091) 731855	(091) 721964
MARINE OIL SPILL ACTION PLAN REGIONAL INDUSTRIAL CONTROLLER (MOSAP RIC)		
North Fremantle No. 8		
T. Wilson - Shell	327 1470	389 1571
Fremantle No. 7		
C. Robinson - BP	419 0222	(095) 567 2167
STATE COMMITTEE FOR COMBATING MARINE OIL POLLUTION		
(Abbreviation: State Combat Committee)		
Chairman		
Capt. W. Spencer	335 0888	364 4949
Capt. D. Clarke	323 1717	383 1594
Capt. J. Barron	430 4911	339 2780
Deputies		
Capt. D. Oliver	335 0888	528 2584
Mr E. Twigg	430 1301	364 6429
Capt. J. Major	430 4911	385 8496

LOCAL GOVERNMENT	OFFICE	RESIDENCE
Exmouth Shire Council		
K. Graham (Shire Clerk)	(099) 491399	(099) 491079
K. Dickerson (Work Supervisor)	(099) 491399	(099) 491449

ADDENDUM D

ADDENDUM D

EQUIPMENT LOGISTICS PLAN

MOBILISATION OF PORT HEDLAND

CO-OPERATIVE OIL SPILL EQUIPMENT

Oil spill containment equipment will be available on site during operations.

Operating crews for the equipment will be mobilised from Perth to Exmouth by aircraft and from Exmouth to the drilling unit by helicopter.

Listed below are telephone numbers to activate the equipment and personnel:

(a) Contact:

Brambles Marine Division - Sydney
Telephone: (02) 231 8222
Telex: AA72271
Denzil Byrne - After hours phone: (02) 46 1185

(b) Contact:

Brambles Manford - Port Hedland
Telephone: (091) 73 1855
Kevin Welk - After hours phone: (091) 73 1165

Brambles - Oceaneering will be responsible for mobilising three operators from Perth to Exmouth. It is estimated that mobilisation to Exmouth would be achieved within six hours of receiving direction from Minora.

Brambles Manford will be responsible for mobilising one operator from Port Hedland to Exmouth. It is estimated that mobilisation to Exmouth via fixed wing charter would be achieved within two hours of receiving direction from Minora.

ADDENDUM E

ADDENDUM E

MARINE OIL SPILL ACTION PLAN (MOSAP)

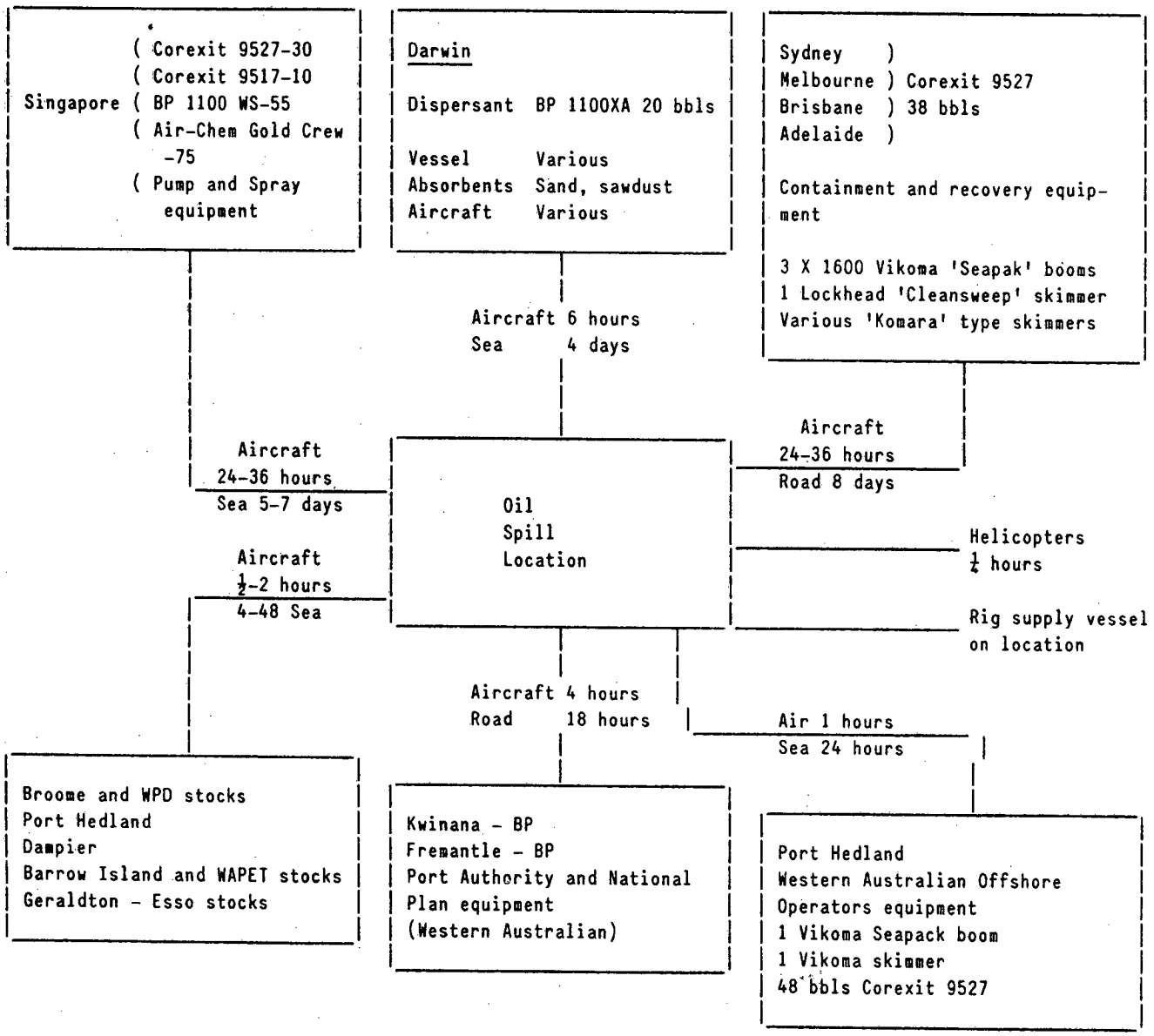
FACILITIES

In the event of an oil spill beyond the company's capacity, there are additional facilities available throughout Australia through MOSAP. A complete listing of these facilities are included in the MOSAP manual. Details of facilities within call of the area of operations are listed below.

TABLE A/E-1

CONTINGENCY LOGISTICS

(Date, volumes and equipment need periodic updating)



ADDENDUM F

ADDENDUM F

DISPERSANT LOGISTICS

(Only dispersants approved by the State Combat Committee are listed.)

LOCATION	DISPERSANT	VOLUME (L)	TIME TO SITE
Drill Site	Corexit 9527	1 000 L	Immediate
Barrow Island	Corexit 9522 Corexit 7664	(WAPET) (WAPET)	Air 1 hour
Darwin	BP1100XA	110 000	Air 6 hours
Exmouth	Corexit 9527	2 000 (Esso)	Air ½ hour
Broome	Corexit 9527 BP1100XA BP1100AB	2 800 (Woodside) 2 800 (BP) 2 000 (Woodside)	Air 2 hours
Port Hedland	BP1100XA BP1100XA Corexit 9527	(BP) (MOSAP*) 10 000 (WAOOSE**)	Air 1 hour
Fremantle and Kwinana	Corexit 9527 BP100XA BP1100AB	(4 000) (4 000)	Air 4 hour
Sydney	Corexit 9527 BP1100XA	(3 000) (4 000)	Air 12-24 hours
Melbourne	Corexit 9527 BP1100XA	(2 000) (4 000)	Air 12-24 hours
Adelaide	Corexit 9527 BP1100A	(1 000) (4 000)	Air 12-24 hours
Singapore	Corexit 9527 Corexit 9517 BP110WD BP1100XA	(Exxon Chem) (BP)	Air 12-24 hours

NOTES: Exxon Chemicals and BP plan to hold the volume of dispersants listed in brackets as their normal stockholding at the locations noted. While actual stocks may vary with time, the volumes listed are levels they aim to maintain.

*Marine Oil Spill Action Plan

**Western Australian Offshore Operators Oil Spill Equipment

ADDENDUM G

ADDENDUM G

CONTAINMENT AND RECOVERY EQUIPMENT

The following is a listing of mechanical spill control equipment in Australia which could be suitable for a potential clean-up operation in sheltered areas should an oil spill threaten an environmentally sensitive locality. As the equipment is owned by various State and port authorities, arrangements for its mobilisation would be made through the Petroleum Institute Environment Conservation Executive (PIECE) organisation. In addition, the National Plan could in an emergency be called upon for assistance.

WESTERN AUSTRALIA	TIME TO SITE
Fremantle Port Authority	Air 8 hours Road 24 hours
2 000' Slickbar, pump and Manta Ray recovery heads 1 x Troilboom Giant 1 x Marco Delta oil recovery vessel - National Plan 1 x 488 m Vicoma Sea Pak - National Plan 1 x 305 m Expandi Boom - National Plan 1 x Single Ship Slide Sweep GTS 185 - National Plan 1 x Trelleborg Oil boom complete with recovery unit - FPA 1 x 610 m Slick Bar oil boom complete with recovery unit - FPA 2 x Thune Fureka portable unloading systems - FPA 3 m oil sorbent pads - FPA 3 m oil sorbent booms - FPA Poly Proplene oil mops - FPA	
Karrakatta (National Plan) Perth	Air 8 hours Road 24 hours
1 x 1 600' Vikoma Seapak boom 1 x 300 m Zoom boom 1 x Marco skimmer recovery vessel 1 x Komara mini skimmer 1 x helicopter spray unit	
Port Hedland	Air 2½ hours Road 16 Hours Sea 24 hours
1 x Vikoma Seaskimmer 1 x Vikoma Seapack boom (Oceaneering for Western Australian Operators Co-operative)	

EASTERN STATES (VICTORIA AND NEW SOUTH WALES)	TIME TO SITE
Botany Bay (National Plan)	Air 24-36 hours Road 10 days
1 x 1 600' Vikoma Seapak boom	
EASTERN STATES (VICTORIA AND NEW SOUTH WALES)	
Sydney (Port Authority)	
1 x 1 600' Vikoma Seapack boom	
Melbourne (Westernport Port Authority)	
1 x 1 600' Vikoma Seapack boom 1 x Lockhead Cleansweep skimmer	
Melbourne (Ports and Harbour)	
1 x Vikoma Seapack boom	
QUEENSLAND	
Pinkenba (Department Harbours and Marine)	Air 36-48 hours Road 8-9 days
1 x 1 600' Vikoma Seapack boom	
Pinkenba (Port of Brisbane Authority)	
1 x Lockhead Cleansweep skimmer	
Gladstone (Harbour Board)	Air 36-48 hours Road 8-9 days
1 x Lockhead Cleansweep skimmer	
Townsville (Harbour Board)	
1 x Lockhead Cleansweep skimmer	
SOUTH AUSTRALIA	
Port Adelaide (Department of Marine and Harbours)	Air 24-36 hours
1 x Troilboom Giant	