

THE HUNGRY GODS
GO TO THE SOURCE

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PART ONE

THE WATERSHED

The lease

The answer is no. People assume the job has more variety in it than it does, and then they are disappointed, and then I have to manage the disappointment as well as the file.

I am the access coordinator for the water supply areas. Capilano, Seymour, Coquitlam. Sixty thousand hectares if you count the off-catchment lands, which I do, because I am the one who gets the calls about them. About fifty-two thousand if you only count the three catchments proper. Nobody outside the department has ever asked me for that distinction and I have never once been able to stop myself making it.

The areas are closed. Not restricted, not permit-only, not open with conditions. Closed. There is no recreational access. There is no through-hiking. There is no fishing, no camping, no cycling, no photography as an activity in itself, no drone, no scattering of remains, no proposal. Every one of those is a category because every one of those has been asked for more than once, and a category is what you build when a question stops being unusual.

I keep a spreadsheet. It is not an official spreadsheet. Officially I keep the access request register, which lives in the records system and has a retention schedule and is perfectly adequate for the purpose of knowing what was asked and what was decided. My spreadsheet is for knowing what people think the answer is going to be before they ask, which is a different thing and is not a record of anything, and if it went to a freedom of information request I would be very interested to see what they made of it.

The largest column is *assumes exception applies to them*. Four hundred and something. I stopped updating it in April.

The form asks eleven questions and the eleventh is the one that does the work. It asks what the applicant proposes to do that requires being inside the water supply area rather than somewhere else. It

is phrased neutrally and it is not a trick, and about one applicant in five answers it properly, and the ones who answer it properly are the ones whose applications take me longest, because those are the files where I have to go and check rather than reply.

I did not write the form. I have twice proposed changes to it and both times the changes were reasonable and both times they died in the part of the process where a form belongs to four departments. The current version has a field for a fax number.

. . .

The instrument is a lease. That surprises people who assume a watershed is owned, or is a park, or is Crown land in some general sense that means nobody in particular. It is Crown land, and there is a lease over it, and the lease was obtained in 1927 by the Greater Vancouver Water District, and it runs for nine hundred and ninety-nine years.

I have a copy. Everybody in the department has a copy. Mine is a scan of a photocopy of something, and the quality is what you would expect, and I have read it more times than I have read anything else in my life including things I chose.

What it does is straightforward. It reserves the land for water supply and it prohibits the uses that would compromise water supply, and in 1927 the use they were worried about was logging, because logging was what had been happening and what was going to keep happening if somebody did not write it down. The lease is not poetic. It is a document about timber, drafted by people who wanted the timber to stop being cut, and the way you make timber stop being cut is that you write a clause about it and you make the clause long.

There had been a reservation before that, in 1905, on similar reasoning. The 1927 lease is the one people cite because it is the one that covers the ground we actually operate on.

The nine hundred and ninety-nine years is the part that gets a reaction. I have watched a room of engineering students receive that number and I have watched them all do the same arithmetic and arrive at the same year and look at each other. It is 2926. I do not tell them what it means because it does not mean anything. A long

lease is an ordinary instrument. If you want land held for a purpose and you do not want to buy it, you take a term long enough that the term is not a factor in anybody's planning, and nine hundred and ninety-nine years is the conventional maximum in the tradition the drafters were working in. It is not a prophecy. It is a number chosen because it was the biggest one available on the form.

I say a version of that whenever the arithmetic happens. It does not land. People want the number to be about time and it is about drafting.

What the lease does not do is stop anything by itself. A lease is a piece of paper in a file in Burnaby. What stops things is that there is a board that has resolved what the land is for, and a statute behind the board, and a set of operating decisions taken over ninety-odd years, and a gate, and a person answering the inbox. Take away any one of those and the lease is still a lease and the answer starts being maybe.

People in this organization talk about the lease the way people in other organizations talk about a founding document, which is to say more often than they read it. I have been in three meetings where somebody cited a provision of it that is not in it. Twice the provision they cited was stricter than the actual text. Once it was not, and that one mattered, and I said so, and was thanked in a way that suggested I had been unhelpful.

. . .

The requests arrive in four ways and I can tell you the proportions to within a few points in either direction.

Email is most of it. There is a general inbox and there is a form on the website and the form asks the questions that matter and about a third of applicants use it. The other two thirds email the inbox directly with a paragraph, and the paragraph does not contain the information the form would have collected, and I reply asking for the information, and about half of them do not reply, which I have come to understand is not rudeness. They wanted a yes fast enough to act on. A form is a signal that the answer is going to take a week, and a week is often longer than the plan they had.

Phone is next. Phone is where the adjacency comes in — people who live near a boundary, people whose properties back onto something, people who have found a gate. Phone callers are more likely to be angry and more likely to be reasonable, in that order, usually in the same call.

Then there is the mail, which is almost entirely legal, and which I forward.

Then there is the fourth way, which is that somebody who knows somebody asks a director at an event, and the director says they will look into it, and it comes to me with a note that says *can we help with this?* The answer to *can we help with this* is no. I have a paragraph for it. It is a good paragraph. It has survived four directors.

The inbox has a rhythm and the rhythm is seasonal in a way I did not anticipate. February is quiet. March is students, because supervisors set project topics in February. May and June are film and stills. July and August are hikers, and August is hikers who are already in the region on holiday and have looked at a map. September is researchers again, because the ones who did not get organized in March have realized they have a season to plan for. November is the quietest month of the year and December has a small strange spike that I have never accounted for.

The spike is a dozen emails or so. I looked at four years of it once and could find nothing in common between them except the month.

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The categories that are refused are not interesting individually and are interesting in aggregate.

Researchers are the largest group and the easiest to feel bad about. They are usually asking for something small: a soil sample from a slope, a bird count, three days with a light trap. The catchments are as close to an unmanaged coastal forest of that size and that duration as exists anywhere near a city on this coast, and everybody in the ecological sciences in this province knows it, and every one of them thinks their study is the study that ought to be the exception.

We do allow research. That is what makes the refusals harder rather than easier. There is a process, it goes through the environ-

mental management people, it has a lead time measured in seasons, and it is granted on the basis of whether the work supports the management of the water supply. That is the test. Not whether the science is good. Not whether the science is important. Whether it supports the management of the water supply, which is what the lease reserved the land for and what the board has resolved the land is for and what I am employed to protect the ability of the organization to keep doing.

So I refuse good science regularly, and I refuse it to people who are polite about it, and the ones who are not polite about it are easier. I would rather be shouted at than thanked. When they thank me I have to write the file note.

Filmmakers are the second group and the least sympathetic and I try to correct for that. Their requests are large — vehicles, crew, generators, time, and a location that is usually chosen from a photograph somebody else took illegally. They are refused, and they are refused again, and about one in five comes back with a smaller proposal, and the smaller proposal is refused as well. What they are asking for is the look of the place, and the look of the place is a consequence of nobody being in it.

Hikers I take less time over than I should. A hiker who has emailed to ask is a hiker who is not in there, and I try to remember that the ones who write are self-selecting for the trait I most want in the population, and my reply should reflect that. It usually does. It is a good reply. It explains the closure, it explains the reasoning, it names three places nearby that are open and are genuinely worth the day, and it does not moralize. I wrote it in my second year. My manager at the time thought the three suggestions were unnecessary and I kept them anyway.

Then there are the ones that do not fit a category, and those are the ones I remember, and they are four or five a year out of several hundred.

There is a fifth way that I do not count because it is not a request. It is the correspondence from people who are not asking for access and want to tell us something about the watersheds — that there is a road we have forgotten about, that a relative worked in there, that a plane came down in there in 1948, that the water tastes different

since March. Most of it is warm and none of it needs anything from me except an acknowledgement, which I send, because somebody wrote a letter to a regional utility about a forest and that deserves four sentences back.

The 1948 plane is real, incidentally. There are several. There is a list.

. . .

Two things are not refused, and neither of them is an exception, and I am careful about that word because the moment something is called an exception somebody builds on it.

The first is work. Contractors, consultants, surveyors, the people who maintain the roads and the gauges and the gates, the crews on the dams. They are in there constantly. Access for work is not access in the sense the public means it; it is a condition of the place functioning. It is governed by a conduct schedule, and the conduct schedule is long, and it covers vehicle washing and fuel handling and waste and food and sanitation and what you do if you see wildlife and what you do if you see somebody who should not be there and what you do if you break down. Every person who goes in for work is briefed against it. Every contract carries it. It is enforced in the way most conduct schedules are enforced, which is to say it works because the people who go in are the same people every year and they know what it is for.

The second is not mine. There are conversations with First Nations about access for cultural practice, and those conversations are conducted by people who are not me, at a level that is not mine, and my role in them is to make sure that nothing I do in my own lane cuts across them. That is all of my involvement and it is the correct amount. What I will say is that they are not a category on my spreadsheet and they were never going to be, because a spreadsheet of people who assume an exception applies to them is a document about strangers making a request, and that is not what is happening there.

I have been asked, in this building, by somebody senior enough to know better, whether that access poses a source water risk. I said

that the question as posed was not one I could answer and that the people handling it were doing so carefully. He accepted that. He was not being hostile. He was being lazy, and lazy in that direction gets expensive, and I have watched it get expensive elsewhere.

The thing that makes the refusals sustainable, and I do mean sustainable rather than easy, is that the reason is good and I believe it. I did not arrive believing it. I arrived thinking that a closed forest of that size beside a city of that size was an overcorrection and that a well-managed permit system with a cap would be better for everybody and would cost nothing.

What changed my mind was not a policy argument. It was two years of reading what the treatment side has to do with what we send them, and understanding that the closure is not a preference and is not a nicety, it is the first barrier, and that every barrier after it is a machine that costs money and electricity and staff and can fail. The gate does not fail. The gate is the cheapest thing we own and it does more than the plant does.

I have said that sentence to five or six people and three of them thought I was being provocative.

. . .

The adjacent-landowner calls are the ones that take the longest, and there is one that has been running for eleven years.

The property is outside the boundary. There is an old road allowance, and the road allowance is on a plan from a period when plans were drawn optimistically, and the road allowance appears, on that plan, to cross into the catchment. The owner's position is that the allowance is a public right of way and that he is entitled to use it. The organization's position is that the allowance was never constructed, that the plan does not create the right he says it creates, that in any event the surface is within the leased area, and that the answer is no.

I have said this to him, in various forms, perhaps forty times. He is not unpleasant. He is sixty-something and he has read extensively and he has developed the specific fluency of somebody who has read only in one direction for a decade. He knows the plan number. He

knows my extension. He calls in the third week of most months, and we have a conversation that has not changed materially in eleven years, and at the end of it he says he will be in touch and I say I am sure he will, and neither of us intends either statement as a threat.

A representative call, from March, which I wrote down afterwards because it was the third one that month.

“It’s Ken.”

“Morning, Ken.”

“I’ve been reading the Land Act.”

“How far in?”

“Section eight.”

“There’s a lot after section eight.”

“There’s a lot before it too. Do you know what a road allowance is?”

“I do, yes.”

“Do you though.”

I said that I did, and that we had discussed it, and he said that we had discussed it before he had read section eight, which was fair, and then he read me section eight. It took four minutes. I have a headset, and I cleared my inbox while he did it, and I am not proud of that but eleven years is eleven years.

Then he said: “So.”

And I said that the position had not changed, and he said he thought it might have, and I said no, and he said all right, and asked after my knee, which I had mentioned once in 2021.

Twice he has retained a lawyer. Both times the lawyer’s letter came to me and I forwarded it, and both times the letter was answered by somebody with the correct authority to answer it, and both times the file went quiet for a season.

He has never gone in. I hold onto that. In eleven years of believing that he is entitled to, he has never once walked past the gate. I do not know what that is. I do not think it is respect for the lease. I think he wants to be entitled more than he wants to be in there, and if he went in and nothing happened he would have to want something else.

The other recurring conversation is internal and is worse, because Ken at least knows what he wants.

“Quick one. Can we help with this?”

“Probably not. What is it?”

“Fellow at the reception last night. Very keen. Documentary thing.”

“Then no.”

“He seemed to think there was a way.”

“There is a way. It’s the form.”

“Right. Could you have a look at it?”

“I’d be looking at a form he hasn’t filled in.”

A pause here, always, in which the director rearranges the request into a shape where it has not been refused.

“Could you give him a call and walk him through it?”

I do give him a call. I always give him a call. The call is nine minutes and it ends with him understanding that the answer is no, and he is invariably pleasant about it, and the director gets an email saying it has been actioned, which it has.

. . .

The manager who signs the refusals is the Conscience-Keeper.

He is not a difficult manager. He does not rewrite my paragraphs.

He stops me. That is the thing about him and it took me two years to stop finding it rude. I will be describing an application and somewhere in the second sentence he will say *no*, flatly, before I have got to what is being asked for, and then he will wait for me to finish, and the answer at the end of it is the *no* he had already said.

He is not guessing ahead. He is not finishing my sentence. He stops, and then he listens to the rest of it properly, and the stopping and the listening are not in the order you would expect.

He knows my name and uses it. He knows everybody’s.

The thing I do that I have never examined is that I take him files that do not need a decision.

Not often. Twice a year, three times. The lake man was one. They are the ones where the answer is obvious and I have written the reply already and there is no question in front of anybody, and I take them up anyway and describe them, and he stops me, and I go back down and send the reply I had already written.

I did that for four years before it occurred to me to ask what I was doing. I still do not have an answer. He has never once suggested I stop, and he has never once said anything about it, and I have never gone up there and felt worse afterwards.

. . .

The last file of yesterday was a man who wants to walk to a lake.

It is not one of the alpine lakes. It is a small one, unnamed on the maps that matter and named on the map he sent, and it is about nine kilometres in from a gate on the Seymour side. He has wanted to go since 1994, when he saw it from a helicopter during work he was doing for somebody else, and he has an idea of it that he described in some detail, and he is now at an age where the nine kilometres is a real question and he says so plainly and does not use it.

The application is complete. He used the form. He answered every question, including the ones people leave blank, and he attached a page explaining why the answers were what they were. He proposed to go alone, in a single day, in September, carrying out everything he carried in, and he offered to be accompanied at his own cost by any staff member we cared to assign, and he offered to sign anything.

He is not a researcher and the visit does not support the management of the water supply.

I took it up anyway, which I do perhaps twice a year, and which achieves nothing and which I am going to keep doing. I got as far as the second sentence and he said no. He was not unkind about it. He did not make me stop — he stopped, and then let me finish, in case there was something else in the file, and there was not.

I wrote the reply this morning. It runs to four paragraphs. The first one thanks him for the completeness of the application, which is not a formality, because it was the most complete application I have received this year and somebody should tell him that. The second one explains the closure and the basis for it. The third one explains the research pathway and is honest about the fact that it will not assist him. The fourth one is the three places nearby.

I did not tell him that I looked at the lake on the imagery after I read his application, or that it is about what he thinks it is. That

would have been for me.

Fire season

We are on call from the first day the fire danger rating comes up and we stay on until it goes down, and the rating is not a season, whatever the calendar says. Some years it is eleven weeks. The bad ones are longer at both ends rather than worse in the middle, which is not what people expect.

The Hand has been on this crew longer than any of us and is the reason I got the job, in the sense that he was the one who told me the posting existed and then did not mention it again, ever, including when I got it.

Something I only saw once somebody outside pointed at it: the falling goes where he is. There is no rule about that. Nobody wrote it down and no supervisor assigns it. But a strike that needs a tree down on a Tuesday gets attended on the Tuesday, and if the shift is wrong for it there is a way in which the ground gets held and lined and the tree waits, and nobody has ever described that as a decision.

I have also watched three people in six seasons tell him about jobs he was not on. Not reporting. Telling. A man who had done something well on a fire in the Coquitlam that nobody senior saw, standing at a truck describing it to somebody who had not been there and was not going to write it down.

There are five of us on the crew I work on and there is more than one crew and I am not going to be precise about numbers because the numbers move and because it is not my department's information to give out. What I can tell you is that Metro Vancouver runs its own watershed fire program, with its own people, on its own ground, and that this surprises everybody I have ever explained it to, including firefighters.

The reason is not complicated and it is not about the trees.

A fire in a catchment is a water quality event. Not a metaphor. An event, with a mechanism.

Fire takes the ground cover and the roots that hold the slope. Then it rains. This is the coast. It always rains. The slope moves.

Fine sediment into the reservoir. Ash into the reservoir. Organic carbon into the reservoir, and downstream it meets chlorine and makes things the treatment people have limits for.

A moderate burn on a steep slope above a reservoir can affect a tap for years. Nothing in the system absorbs that quickly.

So we do not manage fire in the watershed the way you manage fire in a forest that is a forest. We do not have a suppression window measured in days. We have one measured in the time it takes to walk to the smoke. Lightning strikes get attended the same day, every time, without a threshold. There is no size at which we watch and wait. There is nothing in there worth more than the reservoir and nothing in there that we are letting burn to see what happens.

The rating itself is a number that comes off a set of inputs — temperature, humidity, wind, rain in the preceding days, and a set of moisture codes that model how dry the fuel is at three different depths. It is a provincial system and it is the same system everybody in the business uses and it is good. What it produces is a category, and the category determines what happens to my life: whether we are on standby, whether the crews are staged, whether the contractors working in there have their activities restricted, and at the top end whether they are shut down entirely.

The restriction on industrial activity is the part that generates the phone calls.

“You’re joking.”

“I’m not.”

“I’ve got a machine on a low-bed at the gate.”

“I know.”

“It’s raining. It is actively raining on me right now.”

“It rained four millimetres and it stopped at four this morning and the fine fuel moisture code doesn’t care what’s happening to your jacket.”

“The fine fuel moisture code.”

“Yes.”

“Is a number.”

“It is.”

“And I’m a man standing in the rain.”

That one I have thought about since, because he was right in every respect except the one that mattered, which is that a coastal fine fuel dries in about six hours and his jacket does not. He went away. He came back on the Thursday and did the culvert in a day and a half and did it well.

The restriction is the rating and the rating is the rating. A contractor with a crew and a machine and a schedule does not enjoy being told at six in the morning that today is not happening, and the person telling them is not me, and I have stood next to that conversation about forty times. Nobody wins it. The rating is the rating.

. . .

The work is mostly not fire. The work is fuel.

Ladder fuel is the term and it describes exactly what it says. A fire on the ground stays on the ground unless something lets it climb. The something is the middle: the small suppressed hemlock, the dead lower branches, the shrubs that have grown up under a closed canopy and are standing there dry with their tops touching the branches above them. Take the middle out and a ground fire has nowhere to go. Leave it in and a ground fire is a canopy fire in about ninety seconds, and a canopy fire on a slope with wind is not a thing we are equipped to put out and is not a thing anybody is equipped to put out.

So we thin the middle and we keep the top. That is counter-intuitive to people who have been told that a forest is safer when it is opened up, and it is the opposite of what most fuel treatment looks like in the interior of this province, and the reason is the microclimate. A closed canopy on the coast keeps the understory cool and damp. It is a wet forest and it stays wet because it is shaded. Open the canopy and you dry the floor, and a dry floor in a coastal forest with the fuel loads we carry is worse than the ladder you removed. So we go in under the big trees and we take out what is between, and we leave a stand that looks, to anybody who has not been told what to look for, like nobody has done anything to it at all.

That is most of the year. Cutting brush under old trees, on slopes, in the rain, for the eleven weeks a year when it matters that we did.

The other half of the year is training and equipment, and the equipment part is unglamorous and constant. Pumps get tested. Hose gets pressure-tested and rolled and stored and goes bad anyway. Saws get maintained by the people who use them. Every piece of it is inspected on a cycle and the cycle does not care whether there has been a fire.

The training is where the money is and where the value is. Deployment, pump and hose drills, saw certification, first aid, helicopter safety for people who will be near a machine perhaps twice a season, and the annual refresher on the fire behaviour system, which everybody grumbles about and which produced the only genuinely useful argument I have had at work, which was about whether the coastal fuel types in the national system actually describe what we have on the ground here. They mostly do. Not entirely.

. . .

We do it the way we do it because of a vote.

On the tenth of November 1999 the board of the water district met, and the meeting on this item ran two hours, and at the end of it they passed a five-point resolution to end all logging in the Greater Vancouver watersheds. The first point is that the primary purpose of the watersheds is to provide clean, safe water. The third point — the one that governs my job — is that the management plan will be based upon the minimum intervention absolutely necessary.

Everybody on the crew can date it. It comes up perhaps three times a season, always in the same way, which is that somebody new asks why we are cutting brush by hand under trees we are not allowed to touch, and somebody who has been here a while says *ninety-nine*, and that is generally the end of it.

What I have noticed is that the ones who say *ninety-nine* say it flatly. It is not a complaint. It is a date.

There was an argument, and the argument was not stupid, and the side that lost it had a case that has aged in a complicated direction. The position at the time — held by foresters, and by some of the

people who studied the stands, and set out in work that the board had in front of it — was that ending removal would raise the fire risk and raise the pest risk over the following century, because an unmanaged forest of that composition accumulates fuel and accumulates susceptible stands, and that at some point you would be looking at a catchment that was more likely to burn or defoliate than the catchment you started with. The figure that got repeated was a doubling over a hundred and twenty years.

The other side's case was that logging a water supply area is logging a water supply area, that the roads do more damage than the harvest, that the biological diversity is the point, and that the primary purpose of the watersheds is to provide clean, safe water, which is the first point in the resolution and was the first point for a reason.

Both sides were arguing about water. That is the thing I did not understand for my first two years and it changes how the argument reads. Neither of them was arguing about trees.

Our program exists in the shape it has because of the way that went. We do by hand, under a retained canopy, on a small footprint, the fuel work that would have been a by-product of harvest under the other outcome. It is slower and it costs more per hectare and it does not produce anything. It also does not put a road on a slope above a reservoir, and I have seen what an old road does to a slope on a wet November, and I would not trade.

A thing I did not expect about this program is how much of it is watching other people's fires. There is a summer most years now where the interior is burning and the coast is not, and our crews are on standby for ground that is green and wet, and the news is full of towns being evacuated eight hours' drive away, and we cut brush.

You cannot leave. That is what gets to people in their second and third seasons. We are not a resource that gets deployed; we are a resource that stays here, because the catchments do not stop being catchments while somebody else is having an emergency, and the day we send our crews east is the day a strike holds on a slope above Seymour and nobody walks to it.

I have watched two good people leave over that. Both of them went to provincial crews and both of them are happy.

. . .

The strike came in on a Tuesday at 14:41.

We get lightning detection and we get it fast, and the detection tells you a location to a radius, not a fire. Most of them are nothing. A negative strike into wet ground in August does not do anything you would ever hear about. What you are looking for is the one that is holding, and holding means a smoke, and a smoke can take eight hours to show or it can take four days, which is the part of this job that people find hardest to believe. A strike goes into a snag and it sits in the punk wood and it works away at it, and nobody sees anything, and then on Friday afternoon there is a column.

This one showed at 16:20 from the camera and was called at 16:23.

The location was about two thirds of the way up a slope on the west side, in a stand that is old, on ground that is steep enough that the discussion about how to get there took as long as the first part of getting there. There is no road within a distance that is useful. There is an old spur that goes about halfway and stops for a reason that was good in 1970.

We went in five, up the spur in the truck and then on foot, and it took an hour and forty from the truck to the smoke.

The gear is heavier than people expect and less impressive. Pumps, hose in lengths, fittings, hand tools — pulaskis and shovels — a chainsaw, fuel, water, food. The hose is the weight. A slope like that one with a pump at a creek and enough hose to reach the fire is several trips or several people, and we had several people.

The pump would run off a pool in the creek about a hundred and forty metres below and downslope, which is a good distance and a bad lift, and getting water uphill is a question of pressure and of how many lengths you are prepared to carry. The alternative is the helicopter with a bucket, which is dramatic and expensive and which does not put a fire out, it knocks it down, and knocking a fire down is not the objective on ground where the objective is that the reservoir does not get sediment in it. So we ran hose.

It was hot, and the slope was the slope, and the packs were what packs are, and everybody arrived able to work, because that is the

standard and because arriving unable to work is the failure mode every part of the training is designed around.

The recruit is four weeks in. He is twenty-three, he is fitter than any of us, and he is not a fool. He asks good questions. He wrote down the ladder fuel rationale on his second day and got it right, which most people do not, because most people hear *thin the middle, keep the top* and file it as an eccentricity.

He went off the front ten minutes in.

Not dramatically. He did not sprint. He simply walked at the pace a fit twenty-three-year-old walks up a hill when he has been told there is a fire at the top of it and he would like the people behind him to know he understands that. Which is a pace nobody can hold for an hour and forty with a pack, and which is, more to the point, not the pace.

There is a pace. It is slower than you would think and it does not change for anything. It does not change because the fire is holding, it does not change because it is late, and it does not change because somebody young has gone up the trail like a dog off a leash. The pace is calculated backwards from the requirement that five people arrive able to swing a tool for the next eight hours, and it is one of maybe three things on this crew that are genuinely not negotiable.

Nobody said anything.

Five people watched a man walk away from them up a hill at a speed that guaranteed a specific and entirely predictable outcome, and not one of them said a word, and not one of them changed step. Our crew leader did not call him back. Our senior faller, who has thirty-one seasons and opinions about most things, looked at the middle distance. It was not cruelty and it was not a lesson being administered. It was the absence of a decision. There was nothing to decide. He was going to be at a switchback in forty minutes and we were going to walk past him at the same speed we were walking now, and everybody on that hill including, on some level, him, already knew it.

He was at the switchback in thirty-five.

He was sitting on his pack with his forearms on his knees and his head down and he had been sick and had been tidy about it, and when we came round he stood up too fast and said he was fine.

The choreography from there is fixed and I have watched it four times in six seasons and it has never once varied. Nobody stops. Nobody breaks the line. The crew leader, going past, says a number — it is always a number, it was *twenty* this time, meaning twenty minutes to the smoke — and does not look at him, because looking at him would make it a conversation. Then the rest of us, one at a time, and nobody says anything at all.

The Companion was last in the line. She had been behind him from the truck, at the pace, fifteen metres back the way you walk behind somebody who is going to stop. Going past she took one item off his pack — did not ask, did not break step, did not look at him either — and carried on.

He got up and fell in behind her. It takes about nine seconds from the first of us reaching him to the last of us being past, and at no point does the pace alter.

He was back at his own place in the line inside four minutes, which is a compliment, and he does not know it yet.

She carried the extra to the top and did not mention it and did not give it back until we were bucking, when she put it on the ground beside him without saying anything, and he said thanks, and that was that.

I did exactly the same thing in my first year. Not the sick part. The rest of it. There is a version of this in which somebody would have told me, on my first day, that the pace is the pace and here is why, and I would like to be able to say that I would have listened, and I have now watched enough of them not listen that I have stopped believing it.

. . .

It was a single snag, holding, about four metres of it burning inside, with a spread of maybe eight metres of ground fire around the base where it had thrown material down.

The ground was drier than it looks in photographs. That is the thing about the coast in the third week of a dry spell: the surface duff goes off fast and the mineral soil underneath stays damp, and

what you get is a fire that spreads easily and does not go deep, which is workable if you get to it on the day and is not if you do not.

The ground fire we had lined in about twenty minutes. That part is hand tools and it is dull and it is exactly what the training is for.

The snag was the question, and the snag was the Hand's. A holding snag has to come down, because you cannot put it out standing and you cannot leave it, and it will throw for as long as it burns. Coming down means somebody falls it, and falling a burning tree on a slope with four other people below you in the smoke is the part of the day that is a real decision with real inputs — the lean, the rot, the escape route, where everybody is, what is downslope of where it is going.

There is a pause before that. Everybody takes it and he takes it, the same as the rest of us, standing back with the saw down and looking at the thing for however long looking at it takes.

What is different is where it lands.

A faller calls a lay before he cuts. On flat ground with a sound tree you can put it close, and close is the standard, and close is what the trade means when it says a man is good. On a slope, in smoke, with rot in the butt and the top burnt out of it and the lean fighting the ground, nobody puts it anywhere. You call a direction and a rough arc and you get it inside the arc and everybody is satisfied and nobody counts the metres.

He calls the spot. Not the arc. He said it would come across the fall line and lie between two stumps that were maybe four metres apart with a leaning cedar at the top end of the gap, and I remember thinking that the cedar was the problem and that if it hung up in the cedar we were going to be there another three hours.

It came down between the stumps. It did not touch the cedar.

That is the sixth season I have watched it and I do not have a season where it went otherwise. The crew's account is that he has been falling thirty years and has the eye, which is a thing people say and which is true of our senior faller, who has thirty-one and who is excellent and who calls an arc like everybody else. I have never asked either of them about it. There is nothing to ask. The tree went where the man said it would go, which is the job, and asking a faller why his tree went where he said it would go is not a question anybody would understand.

We bucked it and we opened it up and we worked the smouldering out of it, and that is another two hours that is not interesting.

. . .

We were on that hill until 02:10, which is normal, because the fire is out when it is cold and cold is a decision somebody makes by putting a bare hand in it, and that takes as long as it takes. Then we walked out, and then there was a patrol on it the next day and the day after that.

Total area, when it was measured properly, was under a tenth of a hectare.

That number is the program. Five people, twelve hours, a helicopter on standby that was not used, and under a tenth of a hectare, on a slope above a reservoir that supplies water to a couple of million people who will not hear about it and should not have to. If it had been found on Friday instead of Tuesday it would have been four hectares, and four hectares on that aspect with the wind that came up on Thursday would have been the kind of number that ends up in a briefing note, and the sediment work would have run for years.

The rating dropped nine days later.

I filed the report on the Wednesday and it went in with the others. There is a line on the form for cause and I wrote *lightning*, and there is a line for area and I wrote the number, and there is a box at the bottom headed *additional comments*, and in six seasons I have never once had anything to put in it.

Forest health

The plots are the job.

Permanent sample plots. Three water supply areas. Various dates, various people, various reasons.

Some older than me. Some older than anyone in the section. The oldest were put in by a man working from assumptions this organization abandoned in 1999. His numbers are still good. A diameter is a diameter.

Forest health. Insects, pathogens, invasive plants, and the long argument about the climate. I am a technician. I do not set the program. I go to the plots.

The season below is out of my field book. The field book has coffee on it. It also has a page where a wasp got in, died, and was pressed flat by the closing of the book. I kept that page rather than recopy it.

A word about who uses this, because for my first two years I did not know and assumed it was nobody.

The health data goes three places. It goes to the fire program, which wants stand condition and dead standing volume and wants it by polygon. It goes to the watershed management plan review, which happens on a long cycle and which needs a defensible statement about whether the minimum-intervention approach is producing the forest it was supposed to produce. And it goes, in aggregated form, into the source water assessment work, which is the drinking water side asking what is upstream of them and what it is doing.

The third one is the one that took me longest to understand, because a hemlock at plot 43 does not obviously have anything to do with a tap in Burnaby. It does. It is four steps away rather than one, and every step is real: the insect defoliates the stand, the stand dies standing, the dead stand either burns or falls, and either of those puts material on a slope above the water. Four steps and about a

decade. That is not a timescale that produces urgency. Which is why somebody counts egg masses in May.

. . .

14 April. Seymour, lower. Plot 22. Access road wet, walked from the gate. Re-measure complete. Nothing.

The section head came with me on that one, which he does perhaps six times a year and which nobody has ever explained to me. He does not supervise. He walks, he looks at the stand, he says a thing about it, he goes back to the truck and does email on a phone with no signal, which he must know has no signal.

What he said at 22 was that the hemlock component on the north side of the plot was under stress. I measured the north side of the plot. The north side of the plot was under stress.

He is the All-Seeing and he has been doing this for twenty-two years and I have stopped writing it down.

16 April. Seymour, mid. Plots 24, 25, 26. Nothing at 24 or 25. Some flagging on the western hemlock at 26, three stems, lower crown only. Photographed. Almost certainly nothing.

19 April. Capilano, lower. Plots 8 through 12. Re-measure complete. Two mortalities at 11, both suppressed hemlock in the understory, both expected, both recorded as such. A person who has not done this work would want to know why we bother recording the death of a tree that was going to die and that nobody was managing. The answer is that a mortality rate is only a rate if you count the ordinary ones, and that a person in 2044 pulling plot 11 will want to know that in the spring of this year two suppressed stems died and nothing else happened. Most of what I write down is a record that nothing happened. That is not a complaint about the work; it is the work.

22 April. Coquitlam. Invasive plant survey, road corridor, kilometres 4 through 9. Knotweed at the 6.2 pullout as expected, treated last year, resprouting from the margin as expected. Recorded. Scotch broom at 7.8, new, small, pulled by hand, bagged, out.

. . .

Knotweed is the clearest example of what this work is.

It comes in on machinery. A bucket with soil in it. A fragment of rhizome the size of a fingernail. That is enough. Somebody brings an excavator in to do a culvert. Eighteen months later there is a patch.

Nobody was careless. Moving equipment into a place moves what is on the equipment. We move equipment into the place because the roads and the culverts and the gauges have to be maintained.

The conduct schedule has a clean-equipment provision. It is a good provision. It is complied with. There is still knotweed at 6.2. Compliance is a rate, not a state. Over enough machine-hours a rate produces an outcome.

We treat it. Multi-year on each patch. Three clean years before eradication.

I have a patch on the Coquitlam side I have been visiting since before I had this title. Forty square metres then. Four now. That is a success. There is no form it reads like one on.

. . .

The other invasives are duller and more numerous.

Broom. Comes in on vehicles and boots. Dies if you pull it before it seeds. A question of being there in June, not a question of technique.

Blackberry along two corridors. A losing position we hold rather than win.

Reed canarygrass, one ditch, Seymour side. Somebody will have to make a decision. Currently monitored. Monitored in this section means what it means everywhere else.

There is a longer conversation, which happens about once a year and never resolves, about whether a road corridor inside a closed watershed is worth treating at all, given that the plants are confined to the disturbed margin and the forest interior is doing what it has done since 1999. Closing. The answer we have arrived at: a margin is a source. A source with vehicles moving along it is a distribution system. That is enough to keep funding a technician and a sprayer.

5 May. Capilano, upper. Plots 41 through 44. Access by truck to the 11 km, walked from there. Two hours in, two out.

Looper egg mass survey — the beginning of it. Nothing at 41 or 42. A few at 43. I want to be careful about *a few*, because *a few* is the word that gets a person's season taken away from them and given to somebody senior.

Western hemlock looper is the one that matters here. It is native. It is present all the time at a level so low that you would never find it if you were not looking for it on purpose. Then it comes up. The cycle has been studied for eighty years and characterized to nobody's satisfaction. When it comes up it defoliates. Hemlock is the dominant species across most of this ground.

An outbreak is not a fire and it does not look like a disaster. It looks like the forest going brown in patches over two or three seasons. What it does to us is delayed and is about mortality. A stand defoliated hard for two or three years carries a lot of dead standing timber. Dead standing timber on a slope above a reservoir is a fuel problem, and in time a stability problem. The fire crews and I look at the same hectares for different reasons. We write separate reports.

There is also the direct water quality question — a defoliation event puts a large amount of organic material on the ground in a short period — and I am not qualified to speak to what that does downstream, and the people who are qualified are careful about it, and I have noticed that the careful ones say less than the confident ones and are usually the ones who turn out to have been right.

5 May, continued. Egg masses at 43: recorded, count attached. Photographs. Flagged for a second visit.

. . .

19 May. The looper conversation, in a meeting room in Burnaby. That is where the field season gets decided.

The question was whether the 43 count and two other counts from the Capilano side were the beginning of something. It is a real question with a real cost attached to getting it wrong in either direction. Call an outbreak that does not happen and you have spent a season's survey effort and some credibility. Miss the beginning of one and you are two years behind on ground where being two

years behind means you are now doing fire planning instead of forest health.

The section head who runs that meeting is the All-Seeing.

He had not been to 43. He had been to the Capilano side in the third week of April on other business. Roads. Nothing to do with this. He said the stand condition — not the egg counts, the condition of the stand, crown density and the proportion of the hemlock component under stress — for three separate polygons, and one of them was mine, and he was closer than my write-up was.

I checked afterwards. Everyone assumed he had read the previous survey, and the previous survey does not contain that, because the previous survey was 2023 and the polygon boundaries were redrawn in 2024.

The decision was to extend the survey and call nothing. Right decision. I would have argued for it.

. . .

What people misunderstand about the looper is that we are not trying to stop it. There is no version of this where anybody sprays sixty thousand hectares of coastal forest, and there is no version where anybody would want to, and the 1999 resolution would not permit it if there were. Minimum intervention absolutely necessary is a phrase with a lot of work in it and this is one of the places it does the work.

What we are trying to do is know. Know early, know where, know how hard, and hand that to the people who plan around it — the fire program, the roads, the drinking water quality people who will want a longer lead time than anybody else and who will ask questions in a meeting that I cannot answer and will have to go away and get answers to. An outbreak we saw coming is an operational problem. An outbreak we did not see coming is three departments finding out at once, in August, from a photograph.

So the survey is the product. Not a treatment, not a plan. A number, produced on time, that somebody else uses.

2 June. Seymour, mid. Plot 26 revisit. The flagging on the three stems has not progressed. Cause not determined. Recorded as *undetermined, no progression, monitor*.

Undetermined is a real category and I want to defend it. There is a pressure, in this kind of work, to attribute. Somebody asks what is wrong with the trees. *I do not know* sounds like a failure. *Drought stress* sounds like an answer. Drought stress is available for almost anything and unfalsifiable at the resolution I work at. So I write *undetermined*. More often than my predecessor did. The first time my section head saw a run of them he asked about it. I said I would rather have four undetermined and one real attribution than five attributions I could not defend. He said that was fine. He did not raise it again.

11 June. Capilano, upper. Extended looper survey, plots 41 through 49 plus four supplementary points.

The count at the supplementary point above 44 came out at two hundred. Not about two hundred. Two hundred. Counted twice. By me. On a standard sample, by a method that produces a hundred and eighty-three, or two hundred and twelve. Not two hundred.

I counted a third time. Two hundred. I sat on a stump for a bit. Then I wrote *200* in the field book and put a small circle round it, which is what I do when I am going to want to know later that I noticed.

It went into the transcription as 200. It went into the database as 200. Nobody has ever mentioned it. There is no reason anybody would; two hundred is a completely ordinary number for that count and it sits in the middle of the range and it did not change any decision. The only thing wrong with it is that counts do not come out at round numbers, and that is not a thing you can put in a field.

. . .

18 June. Climate plots, all three areas, annual read.

Separate from the health plots. Newer. The part of the program I expect to matter most and will not be here to see matter. Growing season, moisture stress, species composition. Their value is a function of the length of the record. Everything I do on them this year is worth nothing this year and something in 2060.

There is a particular discipline to work whose value is deferred past your career. It is not noble and it does not feel like anything. It

feels like a wet afternoon and a data sheet. But you do not get to skip a year, because a gap in a long record is worse than a shorter record, and the person who takes over my plots in whatever year that happens will pull the file and see whether I went out in the wet Junes.

24 June. Coquitlam. Knotweed re-treatment, 6.2. Broom at 7.8: no resprout.

7 July. Capilano. Extended survey continues. Counts through the upper plots low and consistent. The 43 signal does not repeat anywhere else and does not build at 43.

21 July. As above. Nothing.

11 August. As above. Nothing.

It was not an outbreak. This is the ordinary result. Most years are the ordinary result. If you cannot be interested in the ordinary result, this is the wrong section. The interesting years arrive about twice in a career. Everything in between is going to plots and finding what you found last time.

26 August. Seymour, upper. Plots 51 through 55. Nothing.

I have written *nothing* in this book forty-one times this season. I counted, in September, for no reason I could defend.

The number that goes to the annual is not *nothing*, of course. It is a set of measurements, and the measurements are the record, and the record is what somebody will use. But the field book says nothing, because that is what I saw, and one of the things this job teaches slowly is that seeing nothing is a result and that a technician who stops writing *nothing* is a technician who has started finding things.

. . .

3 September. Correction, and it is mine.

In 2024 I assessed a polygon on the lower Seymour as early hemlock decline associated with root disease. I said so in the annual. It went in. It has been cited twice since: once in a fuel discussion, once in a briefing note that went further up than my work usually goes.

It is not root disease.

I have been back four times since, and the pattern is wrong for it — the mortality is not expanding from centres the way it would, and the two stems I had put most weight on have not progressed at all in two years, which they would have. Most likely it is a windthrow event from before my time. It opened the stand and left a cohort of residuals with damaged root plates. They are declining on their own schedule. They will finish. The stand will close.

The reason I went back four times is the looper. Extending that survey in May cost eleven field days and produced nothing, and nothing was the right answer, and I had watched a room take a decision properly on four visits' worth of evidence. Then I went and read my own 2024 sentence and it had been written on four.

I could have left it. That is the honest thing to record. Nobody was going to catch it. The polygon is not on anybody's list and the briefing note has been filed and forgotten and the fuel discussion moved on to other ground for other reasons. The cost of leaving it was zero and the cost of correcting it is that a thing I wrote and put my name to is now wrong in the record with my name still on it.

I wrote the amendment on the third and sent it on the fourth. It runs to a page and a half. It says what I assessed, what I now assess, what changed my mind, and what should have made me less confident in 2024, which was that I had four visits' worth of evidence and wrote a sentence that needed twelve.

The section head acknowledged it the same day, in three words, and forwarded it to the two places it needed to go. He did not ask me about it and he did not tell me it was the right thing to do, which I was glad about, because if he had told me it was the right thing to do it would have become a thing I had done rather than a thing that was now correct.

The annual for this year has a line in it that reads: *Polygon 7-114, 2024 assessment amended; see attached*. That is the visible outcome. Somebody in 2031 will pull the polygon and get the amendment with it. They will not know it was volunteered. They will have no reason to care. They will have the right information. That is the point.

11 September. Capilano. Final looper survey of the season, upper plots. Counts low. Closing the season on this.

The 43 signal did not repeat. It did not build. It is now a line in an annual saying a thing was looked at and was not there. Somebody reading it in five years, if there is an outbreak by then, will pull this season. They will see the extended survey. They will see the counts. They will know it was checked properly and was not happening. That is worth the eleven extra field days it cost.

If there is no outbreak, nobody will read it at all.

Both of those are fine. I did not always think so.

19 September. Seymour, mid. Plot 26. The three stems are dead. Recorded. Cause undetermined.

Somebody is inside

It came slowly and with long gaps and it was not an investigation. I have told it twice and both times to somebody who asked.

Watershed patrol. There are three of us across the three areas, and people assume things about that job which are not true, and the assumptions are always in the same direction, which is that we are some species of police. We are not police. We are not conservation officers either, and conservation officers have powers that would surprise you and that I have twice wished I had and am on balance glad I do not, because a person with powers gets used differently by an organization than a person without them.

What we have is a bylaw, a radio, a truck, a set of keys, and the fact — and this is the one that matters, this is the actual instrument — that we are the only people who go everywhere.

The geography does not fit in a head until you have driven it, and then it fits and will not come out. Eleven tributaries of any size in the Capilano alone. Thirty-three named mountains across the three areas and a larger number of unnamed ones. Roads that are on the map and roads that were on a map and are now a line of alder. If you took every kilometre of road in the water supply areas and laid it end to end I could not tell you the number, and I have asked, and the answers I have been given differ by enough that I have stopped asking.

Nobody is ever alone. That is the first operating rule and it survives every other pressure. Two vehicles or two people with a schedule, and a check-in on a clock, and a person somewhere who knows the schedule and will do something specific at a specific time if the check-in does not come. It is not a courtesy and it is not culture. It is written down, and it is the reason none of the three of us has ever been the subject of the kind of day I am about to describe.

The Companion holds the schedule most weeks. Which means that on any given afternoon there is a person at a desk who knows which drainage I said I would be in and what time I said I would call, and who will start making calls at a defined interval after I do not. I have never tested it. I know two people who have.

Most of the job is gates. There are a lot of gates. They get checked, they get maintained, the locks get changed on a schedule and off-schedule when something happens, and a surprising proportion of my working life has been spent standing in the rain looking at a hinge.

A locked gate in a coastal rainforest is a machine for failing. Water gets into the mechanism and the mechanism seizes. A tree comes down across the approach and the gate is protecting nothing, because there is a hundred metres of open ground beside it where the root plate lifted. Somebody with a legitimate key leaves it unlocked because they are coming back in twenty minutes and then does not come back for a week. A gate is a statement about intent and it works on the population that reads statements about intent, which is most people, which is the point and is also not much of a boast.

I replace locks. I replace hinges. I have a bar and a can of penetrating oil and a length of chain in the back of the truck at all times and I have used all three in the same afternoon more than once. In fourteen years I have found precisely two gates that had been cut, and both of them were cut by people who wanted a shortcut for a vehicle and both of them were the same summer and I never established who.

Then signage, which is its own long argument about how much of it there should be, and whether a sign that is ignored is worse than no sign, and which I have been on both sides of. Then the cameras, which are for wildlife and for roads and are not a surveillance system in the sense the word implies, though they do occasionally show a person, and the ones that show a person are the ones that produce a week like this one.

The cameras are worth a sentence because everybody assumes something about them that is wrong. They are wildlife cameras and road cameras. They are not networked in the way people imagine, they are not watched by anybody in real time, and the majority of

what they record is a branch moving. They get pulled on a cycle. If somebody walks past one on a Tuesday, we may know about it on the following Monday, and that lag is not a deficiency being managed toward zero; it is what the equipment is for.

What that means in practice is that most of what we do is after the fact. We are not catching people. We are establishing, later, that somebody was there, and then making a decision about whether that changes anything, and usually it does not.

It is a driving job with a small number of days in it that are not. Six hours in a cab is six hours in a cab whichever way you say it.

Six hours a day in a truck on gravel, alone in the cab and never alone on the schedule, with a thermos and a radio and a list of gates, and the list is the same list it was last month and will be next month.

You learn the roads, and I do not mean navigationally, because navigationally you learn them in a month. You learn where the water sits after rain. You learn which culverts are going to be a problem in November, and you learn it in July, standing in a dry ditch, looking at something that is not there yet. You learn which corner has the alder that comes back. You learn where the deactivated spur is that somebody could get a truck up if they were determined and stupid, and you learn that there are four of those and not the one that is on the map.

That is the asset. That is the actual asset of this job and it is not written down anywhere and it takes the better part of five years and it is going to leave with me, and I have said that in a meeting and watched it be agreed with.

There is a person retiring next year from the Coquitlam side who has thirty-one years of it. There is no mechanism for getting what is in that man's head into a system. We have talked about it. It comes up at every workforce discussion. The proposed solutions are all training programs and none of them are the thing, which would be somebody driving beside him for two years.

. . .

The vehicle was on the 14 September.

It was parked at the end of a spur off a road on the Seymour side, and the spur is a spur that nobody parks at, because there is nothing at the end of it and because getting to it requires having got past a gate that was locked and was still locked. It was a small grey hatchback, twelve or fifteen years old, clean. It was not hidden. That is the detail I kept coming back to. Somebody who is doing something they know to be wrong hides the car, and this one was parked square in the middle of the turnaround like it was outside a house.

I found it at about ten in the morning during an ordinary run and I did what you do, which is nothing dramatic: I recorded it, I photographed the plate, I called it in, and I looked around for twenty minutes to establish that there was not somebody sitting fifty metres away having a sandwich, and then I left it and carried on with the run, and came back at four.

It was still there at four.

That is when it becomes a different sort of day, because a vehicle at ten and the same vehicle at four means a person on foot in sixty thousand hectares with about three hours of usable light left, and the calculation stops being about trespass and starts being about whether somebody is going to be out there overnight.

The first thing that happens after you find a car is that you become certain of things you do not know. I was certain, by mid-morning, that he had gone up the main creek, because the main creek is where the old road goes and because a person who has parked at that turnaround has parked there for the road. I said so on the radio. It went on the map.

There was one dissent and I did not take it.

"Could be the bench."

"There's nothing on the bench."

"That's what I mean."

"He's parked for the road, Dave."

"He's parked for the turnaround. It's the only place to park."

That was the sum of it, ten seconds, at the tailgate, and I said the thing about the road and he shrugged and got in his truck, because he had been doing this three years and I had been doing it eleven, and because he was not certain and I was.

It was a completely reasonable inference and it was wrong, and it stayed on the map for twenty-three hours, and the thing about a reasonable inference on a map is that it stops being an inference by the second time somebody reads it.

. . .

What follows is two days and I will not pretend it was efficient.

We ran the plate. That takes a phone call to somebody who can do it and a wait, and the wait was about ninety minutes, and it came back to a man in his fifties with an address on the North Shore and nothing of interest attached to it.

A search of that kind is closer to a procedure than to an activity, and I did not know that before the first one and could not have been told it.

You do not spread out. Spreading out is how you convert one lost person into four. You work the access, because the access is where a person on foot will have gone and where a person on foot will come back to, and you work it in a pattern that somebody writes on a map so that at the end of the day you can say which ground has been covered and mean it.

We drove. That is genuinely most of it. Two vehicles — it is always two, there is no version of this where anybody goes alone — up and down the roads in that drainage, stopping at intervals, getting out, listening. Listening is more useful than it sounds and it is the part that people who have not done it find hardest to sit still for. You stand in the road with the engine off for four minutes and you do not do anything.

We called, and voice carries badly on those slopes, and we did it anyway, and we did it at the intervals the plan said and not at the intervals you would choose if you were the one doing the calling.

We did not find anything on the fourteenth, and it got dark, and we made the decision that everybody hates, which is to leave a vehicle where it is overnight and start again at first light, because a night search in that terrain with three people puts three people at risk to reduce the risk to one, and the arithmetic on that has been done by people better at it than me and the answer is no.

. . .

There was a conversation at the truck at the end of that first day that I have not forgotten and that I am not going to dress up. Three people, tired, in the dark, deciding to stop. Nobody argued. Everybody wanted to keep going and everybody knew what the answer was, and the person who said it out loud said it in five words, and then we all stood there for a moment doing nothing, and then we got in the trucks.

That is what those decisions are like. They are not dramatic and there is not a dissenting voice and the reason it is hard is not that anybody disagrees.

I went home at about ten that night and did not eat and sat in the kitchen with the radio on the counter, which was pointless because the radio does not reach my kitchen, and then went to bed at midnight and got up at four.

I slept badly.

The thing occupying me was not the man, particularly. It was the arithmetic. Fourteen degrees overnight and no rain forecast, which is survivable for a person in ordinary clothes, and I had run those two numbers about nine times by then and they had not changed and were not going to. Fourteen and dry. Somebody in reasonable health, one night out, no injury we knew of, fourteen and dry. That is a person who is uncomfortable.

Nobody had told me he was sixty-one and had already been out one night when I found the car.

. . .

Fifteenth, 06:40, back at the spur. Vehicle still there. Frost on it, which told us something about how long.

By eight there were five of us and by nine there were seven, and at that point it is not a patrol matter any more in the sense that I stop being the person deciding things, which is correct and which I was glad about.

The people who arrive are not all from here, which is the part I had not expected the first time I saw it happen. Search and rescue

has a structure and the structure works and the structure does not care that this is a closed watershed. There is a set of arrangements about how that goes, which were written down long before I started and which exist precisely so that on a morning like that one nobody has to negotiate anything. The gate opens, people come in, they are briefed on the conduct schedule in about ninety seconds, and then they do what they are good at.

Somebody senior takes the plan. On this one it was our operations superintendent, who had driven up from Burnaby and who I had met twice, and who spent the first eleven minutes asking questions and did not say anything else until he had a map with lines on it. I have thought since that the eleven minutes of questions were the performance and that everything after them was administration.

The drainage above that spur splits three ways. There is the main creek, which is the obvious one and is where the old road goes and is where anybody who had looked at a map would go. There is a north fork that is steeper and shorter and does not go anywhere in particular. And there is a bench on the east side that is not a fork at all, that has no trail on it and no road and no reason, and which I have been onto perhaps twice in fourteen years, both times for something else.

We were going to do the main creek. That is not a criticism of the decision; it was the right decision on the information, it is what the search plan said, it is what I would have said and did say.

The Seeker was one of the seven. He does hydrometric work and he is in that country constantly and he was there because he was there, and he did not argue with the plan.

What he said was a plan number and a year. Nineteen fifty-six, the reconnaissance mapping, held by the province, superseded twice. He said the bench is on that one and is on nothing since, and that the man had a photograph.

Nobody had proposed the bench. Somebody said it was a long way for nothing and he agreed that it was.

He found him at 10:20 on the bench.

There is a moment when somebody is found which does not go the way it goes in accounts of it. The radio call was flat. Location, one person, conscious, walking with assistance, and a request for

the ambulance to be moved to the spur. That is it. Nobody cheered. There were four people standing on a road half a kilometre away who had just heard the best thing they were going to hear that month, and what happened was that our superintendent said *copy* and then said the next three things that needed to happen, and everybody went and did them.

I have thought about that since and I think the flatness is the training. There is a distinct amount of relief you are allowed to have while there is still a man on a bench who has to get off it, and the number is zero, and everybody knew the number.

. . .

The man was sixty-one, not fifty-something. He was cold and he was in poor shape and he was entirely lucid and he had been out for two nights, not one, because he had walked in on the thirteenth and the vehicle had been there a day before I saw it and I had no way of knowing that and have made my peace with it in the way you do, which is incompletely.

He had come in for his father.

His father had worked in there. In the fifties, on the logging, before the ninety-nine resolution and before most of what anybody now working there would recognize, and had talked about a place on a bench above a creek for the last forty years of his life, and had died in March. The man had a photograph. He had been trying to find the place in the photograph, which is a thing you cannot do, because the photograph is of second growth in 1956 and the same ground now is a different forest and nothing in the picture is still standing.

He had not been trying to scatter anything and did not have anything with him to scatter. He wanted to see it. He said that several times, on the way down, without pressing it, in the tone of somebody who knows he has caused a lot of trouble and has decided that the honest answer is the one he is going to keep giving.

He apologized to each of us separately. He apologized to the ambulance crew.

Getting him down took four hours and it was not technical and it was long. He could walk with two people beside him and could not walk far, and the bench is the bench, and there is no road. The ambulance met us at the spur beside his own car, which he looked at on the way past and did not say anything about.

He talked most of the way down. Not confused talk. He wanted to explain, and I think he had decided somewhere in the second night that if he was found he was going to explain properly rather than minimize, and he held to it in a way that was difficult to be near.

He got a caution and a letter. He did not get a prosecution, and I was not the one who decided that and I would have decided the same. The bylaw was breached, and he knew it was breached, and he said so before anybody asked him.

. . .

I asked, afterwards, about the bench.

Not in an interrogating way — we were putting gear in the truck and I said something like *how did you know about that plan*, and he said which archive holds it and what the reference is.

Which is an answer and is not the answer. Knowing that a bench appears on a 1956 sheet does not tell you a man is standing on it. I said so. He said the photograph was 1956.

I let it go. I have thought about it since and I have not raised it, partly because there is nobody to raise it with and partly because the outcome was a man in an ambulance instead of a man on a bench.

He was right about the sheet. I have looked. There is a seep marked on it that is not on anything since.

The paperwork on something like that is heavier than the day. There is the patrol log, which is mine and is contemporaneous and which I wrote at 04:00 on the fifteenth because contemporaneous means contemporaneous. There is the incident report, which is a different form with a different audience. There is the bylaw file, which is the only part that concerns the trespass and which is four pages and one of the shortest documents produced. There is a note to the source water people, because a person spent two nights in a catchment and somebody has to make a judgement about whether

that is a water quality matter, and the judgement was that it was not, and the judgement still had to be made and written down by a person qualified to make it.

And there is the debrief, which happened eight days later in a room in Burnaby with eleven people in it, and which was conducted properly, and in which the twenty-three hours the main creek spent on the map was raised by somebody who was not me and was discussed without anybody being blamed and produced one change to how we write a first-day search plan.

I have been in debriefs elsewhere that were not like that. I have thought about the difference and I think it comes down to the fact that nobody in that room was going to be promoted or not promoted on the basis of it.

. . .

The file closed on 3 October.

I do not know what happened to him. That is the ordinary condition of this work and it took me about five years to stop finding it unsatisfying. We are the front half of things. Somebody gets found and handed over and the handing over is the end of our involvement, by design, because we are not qualified to be involved further and because the involvement would not help him.

I know that the letter went. I know it was the standard letter, which explains the closure and the basis for it and is four paragraphs and is, I have always thought, better written than it needs to be.

I do not know whether he replied. I do not know whether he is well. I drove past the spur in November and again in February and there was no car, and I noticed that I had looked, both times, which is more than I usually notice about my own habits.

The registered tour

The areas are closed to the public with the exception of registered tours.

I am the exception. Or rather I am the section that administers it, and I say the sentence carefully, because the moment somebody hears *exception* they begin constructing a route to it, and the route does not exist, and explaining that it does not exist is about a third of my job.

Twice a season somebody says *you're the exception* to me as though it were a compliment, and I have learned to take it as one, because the alternative is explaining, and explaining is what I do for a living and I would rather not do it at parties.

A registered tour is not a way in. It is a supervised presentation of a place, on a fixed route, in a vehicle, at a scheduled time, with a staff member who does not leave you. You see the dam, you see the intake, you see the reservoir, you see a certain amount of forest through glass and a certain amount from three designated stopping points, and you are back at the gate at the time it says on the form. Nobody walks anywhere except at the stopping points. Nobody steps off the paving.

People are always slightly disappointed and always say they are not. I have stopped minding.

What a tour costs, in staff terms, is most of a day for two people and a vehicle and a driver, plus the pre-work, plus the fact that if the rating is up or there is an operational reason then the day evaporates and the pre-work is spent. I mention this because people assume the tours are a public relations budget line and they are not; they come out of a section that also does the school program, the interpretive material, and the answering of every question the region asks us, and every tour day is a day not spent on those.

I have never argued for more tours. I have twice argued against a proposal to increase them, both times successfully, both times feeling like exactly the person the applicants think I am.

. . .

THE SCHOOL GROUP.

Grade fives, thirty-one of them, four adults, one bus.

The bus is the problem and everything else is easy. A school bus on a water supply area road requires a driver who has done the briefing, a route that has been confirmed for that vehicle that week, and a turning plan, because there are three places on the Capilano route where a bus can turn around and one of them is out at any given time.

The children are fine. Children are, without exception, the best tour I run. They ask better questions than adults and they ask them faster and they do not care about my answers being complete. On this one I was asked, in sequence and without a pause, how much water is in there and what happens if it runs out and whether they could drink it right now if they wanted to.

Then the bear.

The bear question is the one I have never had a good answer for and I have been asked it perhaps forty times. The honest answer involves the volume of the reservoir and the treatment barriers and the concept of dilution, and none of that is an answer to a ten-year-old who has correctly identified that there might be a dead bear in the drinking water.

"Is there fish in it?"

"There are."

"Has anyone drowned in it?"

"Not in my time."

"What if a bear drowned in it?"

"Bears do drown in it."

Thirty-one children turned around at once. I have never had a room like it and will not again.

"You're drinking bear."

“You are not drinking bear.”

“He said bears drown in it.”

“There is a building the size of four hockey rinks and its entire job is that you are not drinking bear.”

A hand at the back. “What if two bears.”

I said the building could do two bears. He said what about ten and I said ten, and he went to twenty, and I could see the shape of the next four minutes, so I said that the building had been designed by people who had thought about bears more than he had, which was a mistake, because he said *how many bears did they think about* and I did not know, and had to say so, and it is now the only technical question I have ever been unable to answer on a tour and it was asked by a ten-year-old.

One of them asked why nobody is allowed in. I said because people are messier than bears. The teacher laughed. The child did not, and nodded, and I have thought about that child since.

The other thing about school groups is what the teachers ask, quietly, at the back, at the second stop, and it is always the same two. Where does our water come from — meaning their specific school, their specific tap, which I can usually answer to the level of which source and which main. And: is it safe. Not suspiciously. In the way of somebody who has thirty-one children in their care and has just been told there might be a dead bear in the reservoir.

I answer that one carefully and at some length, because it is the only question all day that the person asking will act on.

What I say at the first stop is the same seven sentences every time and I have not changed them in four years.

Where the water comes from. How much of it there is. That it arrives at the plant without being pumped, because the reservoirs are up there and everybody is down here. That the forest is closed and has been for a century and that this is the first treatment barrier and the cheapest one. That nobody lives inside the boundary and nobody has since before the lease. That everything they can see is second growth and that the logging stopped in 1999. And that the water they drank this morning was in the reservoir behind them roughly a week ago.

The last one is the one that lands. Every time. Not the century, not the hectares, not the lease. A week. People do the arithmetic on their own week and something happens to their face.

. . .

A NOTE ON MY COLLEAGUE.

There are two of us who guide and the other one is not good at it.

I have gone back and forth on whether to put that down and have decided that leaving it out would make this a nicer document and a less true one. He is not good at it. He knows the material better than I do — he came from operations, he has the certificates, he can answer things I have to look up — and he cannot hold a room. He talks to the front three people. He answers a question with more than the question wanted and then keeps going. He has a habit of saying *essentially* before a sentence that is then not essential to anything.

He is aware, which is what makes it a real problem rather than a comic one. He asked me, in his second year, whether there was a course, and there is not a course, and I said there was not a course and then spent a week wishing I had lied and found him one.

He has not got better and he is not going to. He is conscientious, he never cancels, he does the pre-work properly, he is the reason the vehicle inspections are current. If I had to choose between his tours and no tours I would take his tours without hesitating, and if I had to choose between him and somebody charming who did not do the pre-work I would take him, and I have never once said any of that to him.

. . .

THE TECHNICAL DELEGATION.

Eleven people, three of them from a utility in another country, two interpreters, and a person from our own communications section who was there to make sure I did not say anything.

Technical tours are the easiest to prepare and the hardest to run, because everybody on them knows things, and what they know is about a different system, and the visit is a series of moments in which somebody asks a question that assumes a fact about their system that is not a fact about ours.

The recurring one is the gravity. I explained, as I always explain, that the water arrives at the plant without being pumped, because the reservoirs are up there and the region is down here. This is received about as well as if I had told them we get it free. There were, on this tour, two separate follow-up questions from two separate people confirming that I meant what I had said, and a third from an interpreter who wanted to check that she had translated it correctly, and had.

The second recurring one is the closure. Sixty thousand hectares, no public access, no recreation, no residence, no agriculture, and a lease that runs to 2926. There is usually a silence after the 2926. On this tour somebody asked what the population inside the boundary was and I said none, and he asked again through the interpreter, and I said none again, and he laughed, and then stopped laughing.

They were extremely good company and one of them sent a follow-up email with four questions in it that were better than any question I got that year, and I answered three of them and forwarded the fourth to somebody who could.

There was a moment on that tour, at the intake, when the most senior of the visitors asked what our unaccounted-for water was, and I gave the honest answer, which is that at the regional level we know what we deliver to each member connection and that what happens downstream of the connection is a municipal question and is not uniformly metered, and that the number people quote for system losses is an estimate with a wide band on it.

He nodded and wrote it down and I could not tell whether I had impressed him or disappointed him. Our communications person told me afterwards that it had been fine. I have never been sure whether *fine* from that section is a grade or a relief.

THE PUBLIC TOUR.

This is the one with the waiting list.

There are a limited number of public tour spots in a season and they are allocated by a process that I did not design and will not be describing in detail, because every time it is described in detail somebody works out an angle on it. It is fair. It is more oversubscribed every year. People wait years.

Twenty-two people. Two of them had waited four seasons. One of them had come from the interior specifically and had booked accommodation, which I wish people would not do, because the tour cancels for weather and for operations and for fire rating and it cancels without much notice.

What people want from a public tour is to see the reservoir, and they see the reservoir, and there is a moment at the second stopping point where twenty-two people look at it and go quiet, and I have learned to stop talking for about ninety seconds at that point and let them.

Then somebody asks whether they can come back on their own and I say no and we get back on the bus.

The questions on the public tour are almost all versions of one question, which is *how is this allowed to exist*, phrased in about a dozen different ways. Why has nobody built anything. Who stops it. What happens when the lease runs out. Could a government just decide. I have a version of the answer that is accurate and does not editorialize and takes three or four minutes and mentions the board, the lease, the statute and the resolution of 1999, and I give it every time, and about half of them look reassured and the other half do not.

One woman on that tour had been on a list since 2019 and had come with her husband, who had not wanted to come. He spent the first hour on his phone in the back of the bus in the two places where there is signal, and at the second stop he got out with everybody else and stood at the rail and did not go back to the phone for the remaining two hours, and at the gate he asked me how a person applies for the job I have.

I gave him the honest answer, which is that the job I have requires an education background and that the jobs that are actually open are operations, and that the region cannot find operators and is going to be looking for them for the next fifteen years. He said he was fifty-four. I said that this was not the disqualification he thought it was.

I do not know whether he did anything about it. I do not know whether anybody has ever done anything about it. I have given that answer perhaps two hundred times.

. . . .

THE MEDIA VISIT.

Two, one camera, four hours, a list of conditions three pages long.

The conditions are not mine and I do not negotiate them and I have on occasion had to enforce ones I thought were excessive, which is fine, that is what conditions are. No aerial. No off-route. No filming of specific infrastructure at specific angles. Approval of the specific stopping points in advance. A staff member in frame or in shot at no point unless they have agreed in writing.

They were professional and they complied and there was one moment, at the intake, where the camera operator went about eight steps off the paving to get a better angle and I said his name and he came back and said sorry and meant it. That was the enforcement action of the season.

The piece that came out of it was three minutes and forty seconds long and was accurate and used fourteen seconds of the four hours.

THE ONE THAT DID NOT HAPPEN.

A group of eleven, booked in for late September, from an organization I will not name because naming it would identify them. Their access requirement was substantial and genuine and had been declared honestly on the form, and the standard route could not accommodate it, and the standard vehicle could not accommodate it.

It went to the awkward pile, which is how it reached him.

What I saw from my side was a booking that sat in the system for nine days with nothing happening to it, which is unusual, and then a route variation request that went to operations, and then an approval, and then a tour on the day it was booked for, with eleven people on the manifest and eleven at the gate and eleven at the exit.

I do not know what the route variation was. It is in the system and I could look. I have not looked, and the reason is not mysterious: if I look and it turns out to be something ordinary, I lose the version where somebody solved a problem I had already privately concluded could not be solved on that ground with that vehicle. I would rather have the version.

That is not a professional attitude and I would not defend it in a review.

. . .

THE CANCELLATIONS.

Not a tour, but it belongs here, because it is a larger part of the season than any of the above.

Tours cancel. They cancel for fire rating, for operations, for road condition, for a vehicle, for a driver, and twice in my time for smoke. The public tour cancellation is the one that hurts, because those are people who have waited years and who in some cases have driven, and the notice can be under twelve hours.

The message is a template and I rewrote it in my second year and it is the best thing I have written for this organization. It leads with the cancellation rather than burying it under an apology. It gives the reason plainly, and the reason is always true. It explains what happens to their place in the queue, which is that they keep it and go to the front of the next available, and that is the sentence people reply to. And it does not say *unfortunately*, because I took *unfortunately* out and nobody has ever put it back.

Nineteen cancellations last season. Four of them mine to send in a single week in August.

. . .

THE OTHER ONE.

He was in the background of the delegation day, which is where I mostly see him — driving a second vehicle, standing at a gate, holding something. The awkward bookings go to him. Six or so a season.

The Chaos-Weaver runs them. He has the awkward ones — the ones with a component that does not fit the standard route, the ones with a vehicle problem, the ones where somebody has an access requirement that the standard route does not accommodate, the ones that have been rescheduled twice. If a booking has a note on it that is longer than one line, it goes to him.

His manifests come back complete.

Every name on the pre-registration is a person who was at the gate. Every declaration is signed. Every vehicle listed is the vehicle that arrived. The counts at the gate, at the second stopping point and at the exit are the same number three times.

I have run this section for seven years and my own manifests do not do that and nobody's do. Somebody is always missing. Somebody brings a partner who was not on the form. Somebody signs the wrong line. A count comes out one under at the second stop and one over at the exit because a person got on the wrong end of the bus. This is not a failure of administration; it is what happens when you put twenty-two adults in a vehicle and drive them somewhere, and every tour section in every organization I have ever compared notes with reports the same thing.

I mentioned it to him in the second year, in the yard, while he was putting cones in a truck.

"Your manifests come back complete."

"They do, yeah."

"Mine don't. Nobody's do."

"The notes on those bookings are usually pretty clear."

"That's not — " and then I did not have a second half of the sentence, because he had answered the question I asked, and the question I meant was not a question, it was an observation, and you cannot hand somebody an observation and be annoyed when they hand you back an answer.

Which was not what I asked, and is, I have decided since, the answer to a question I had not worked out I was asking. I wanted to know how he gets twenty-two people to a gate. What he told me was that the awkward bookings arrive already explained, because a person who has had to declare something has already thought about the day. He does not manage the group. He reads the note.

I did press, once.

“Six for six. On the awkward ones.”

“Do you want me to take some of the standard route bookings? Even it up a bit.”

“No — ”

“I’ve got the Thursdays.”

“It’s not about the load.”

“I don’t mind the load.”

And then it was a conversation about staffing, and I was the person who had raised staffing, and it went into the section meeting under my name, and I have never entirely recovered from it.

That took eleven seconds. I have replayed it and it is eleven seconds from my complaint to my complaint being an agenda item with my name on it, and at no point did he do anything other than answer me helpfully.

I have stopped raising it, mostly because the one time I pressed, he offered to take more of the standard route bookings so the load was fairer, which was not what I had been getting at, and which I then had to decline, and which made the conversation about staffing.

The other thing about his tours, which I do not put in the same category and which I mention because it is the only complaint I have ever had about them: he schedules them at times nobody would choose. Early. Late. One at what I can only describe as an inconvenient point in the middle of an afternoon. I have asked about this and been told that it was what worked for the group, and when I have checked with the groups afterwards, it was.

PART TWO

THE RESERVOIR

Drawdown

Three reservoirs. Capilano, Seymour, Coquitlam. Everything I do is the elevation of water in those three and the rate at which it is changing.

I am a supply operator. There is a room and there are screens and I am aware of how that sounds. It is not that room. It is a fairly ordinary room with a kitchen down the hall, and the screens show elevations, flows, turbidity, and several hundred other things that are green until they are not.

The desk runs twenty-four hours. Four on, four off, days then nights.

The handover is a book. Paper. We also do it electronically. Nobody trusts that as much as the book.

Most of the time the desk does nothing. That is not modesty. The system is gravity-fed and it wants to work. Left alone on an ordinary Tuesday in March it works.

The operator's function is to notice the day it does not. So the skill is not doing. The skill is knowing what normal looks like at 0300 in March.

I have been asked what I do all night. I say I read the screens. What I mean is that I read the screens the way you read a face.

The reservoirs fill in the winter. Winter on this coast is when it rains and snows. They draw down through the summer, when it does neither. That is the year. Everything else is commentary. The system is designed around it and the system has been designed around it since before anyone alive was working on it, and the fundamental bet — that the wet season will refill what the dry season takes — has been correct every year since the dams went in.

Every year. That number is the reason this job is not frightening and is also the reason I have started, in the last four or five years, to find it slightly frightening.

What follows is a season out of the log. The log is not mine — the log belongs to the desk and everybody on the desk writes in it — but the notes in it that begin with my initials are mine.

What happens at 0300 is that an alarm comes in and is not an alarm.

There are a lot of them. A level switch bounces. A comms link drops for ninety seconds and a point goes bad-quality and then good-quality. A pump station reports a state change. The state change is the pump doing what a pump does.

Amber, then green. Into the list.

Forty or fifty items a night. About one a week is anything at all.

The failure mode of this job is not missing the big one. It is the slow calibration downward — forty amber events a night for eight years and a person stops looking, and stops looking is not a decision anybody makes, it is a thing that happens to you.

The countermeasure is that you write them up. All of them. Every single one goes in the book with a time and a disposition, even the ones that resolved before you finished reading them, because writing a thing down is a small act of attention and forty small acts of attention a night is a person who is still looking in year nine.

. . .

2 May. 0640. Capilano 144.8 m. Seymour 122.3 m. Coquitlam 152.1 m. All three above the seasonal curve. Snow survey from the last week of April: 118% of normal at the upper stations.

A good May is a good May and is not a prediction. The snow is a bank account and the withdrawal schedule depends on temperature, and 118% of normal that melts out three weeks early is worth less than 90% that comes off slowly.

5 May. Snow survey circulated. Two of us on the desk read it at handover.

“Hundred and eighteen.”

“Hundred and eighteen at the upper stations.”

“That’s a good number.”

“It’s a number.”

“You’re a joy.”

He had thirty-one years on that desk and he retired in November and the thing he said next is the only piece of advice about this job I have ever written down: that a full snowpack in April tells you about April, and that the reservoir does not care what the snowpack was, it cares what arrived, and those are two different measurements taken at two different times by two different instruments and people confuse them every spring including people in this building.

19 May. 0700. Peak elevation Capilano, or near enough. Three days of warm weather and the inflow is up. That is melt. After the melt nothing else is coming.

28 May. First stage-one measures for the season across the region. Not us — that is member jurisdictions and the regional plan — but it changes what we expect on the demand side.

. . .

Somebody should explain the stages, because I have watched four people in this building explain them badly, including once to a reporter.

There are stages. The stages are about outdoor water use. The trigger for moving between them is not a single number and never has been. It is a judgement, taken by people with the authority to take it, informed by storage, by the forecast, by the time of year, and by how much of the drawdown is still ahead.

The specific thresholds we work to came out of an argument in 2015. Everybody in this section dates things from 2015. That was a genuinely bad year — a low snowpack, an early melt, a dry June — and what happened after it was about eighteen months of committee work about when stages should trigger.

The position that won was that the triggers should be conservative and early, because an early stage-two costs the region some brown lawns and a late stage-two costs the region its margin. The position that lost was that triggering early, repeatedly, in years that turn out fine, trains three million people to disregard the stages, and that the value of a restriction is entirely a function of whether people believe it is necessary.

The position that lost was not stupid. I have watched the compliance data since and I am not sure it was wrong.

Everybody can date it. It comes up every single season and it comes up in the same words every time. *That's the 2015 thing*. Then whoever said it moves on.

. . .

The reporter thing was three years ago and I was not the one who did it and I have never let it go.

What she asked was reasonable: what number triggers a stage. What she was told was a number. The number she was told appears in an internal document as one of several inputs. It went into a piece as *the threshold*. For the following two summers we had people phoning to say the reservoir was above the threshold and the restrictions were therefore unlawful.

It is not a threshold. There is no threshold. There is a set of considerations and a person with the authority to weigh them. *A person weighs it* is a terrible answer to give a reporter. I understand entirely why my colleague gave her a number instead. The number cost us two summers.

The calls came to the general line and the general line, in August, comes to whoever is on the desk.

"I'm looking at your own website."

"All right."

"It says the reservoir's at eighty-one per cent."

"It is."

"And the threshold's seventy-five."

"There isn't a threshold."

"It was in the paper."

"I know it was in the paper."

"So which is it."

That is the difficulty, in five exchanges. There is no answer to *so which is it* that is both true and satisfying. If I say the paper was wrong, I am a utility employee telling a member of the public that a newspaper is wrong. That position has a known success rate. If I explain the actual process, I am describing a judgement, and

describing a judgement to somebody who suspects you of exercising it badly is not a de-escalation.

What I settled on, by about the fourth call, was: “There’s no number that does it automatically. If there were, you could check it yourself and you wouldn’t have to phone me, and I’d be out of a job, and I’d quite like that.”

That one worked. It worked about seven times out of ten, which for August is astonishing, and I have no idea why. My theory is that people are reassured by an employee expressing a desire to not have his job. I have not been able to test this ethically.

The one that did not work was a man who wanted to know, if there was no threshold, what I was for.

I said I read screens. He said he could read screens. I said that was true and that the difference was that I had been reading these particular screens for nine years, and he said, and I have never come up with anything for this, “So it’s vibes.”

I said it was not vibes. He said it sounded like vibes. I said I could send him the technical basis, which is public. He said no. He thanked me. He hung up. I sat there for a bit.

It is not vibes. It is a documented process with a defined decision authority and a set of inputs and a record. I have said that sentence to myself perhaps forty times since and it has never once made me feel better than the four minutes before he said it.

11 June. 0710. Capilano 143.9 m. Declining as expected. Inflows near zero.

24 June. Fourteen days without measurable rain. Coquitlam holding well — Coquitlam is the deep one and behaves differently and is the reason we are not having a worse conversation.

2 July. 0655. Warm. Demand up hard. This is the first week of the year where you can watch the elevation move on a daily read and see it, rather than infer it.

8 July. 0300. Turbidity spike, Coquitlam intake, twenty-two minutes, back to baseline. No precipitation. Logged, referred to source quality.

9 July. Answer came back: a bank slump in a tributary, small, found on the Thursday, no action required.

That is the event, all of it, and it is in here because it is what a good night looks like. Something happened, it was noticed inside a minute, it was written down, somebody who knew about slopes went and looked, and it was nothing. Four people spent parts of two days on twenty-two minutes of slightly cloudy water and the outcome was a paragraph.

. . .

The refill assumption is the closest thing this job has to a religion.

There is a curve. It is built off the historical record, it says what storage should be on any given date, and it says — this is the part that matters — what a given deficit in July means for where you finish in October. If you are 4% below the curve on 1 July, the record says you finish around here. That relationship has held for a long time and it is the basis for essentially every decision made between June and September.

The person who owns that work is a supply planner with about thirty years on it. He is the best in the building at it and I do not think that is contentious. He built the current version. He briefs the committee on it. When I started, he sat with me for two hours and drew it all on paper, unprompted, on a Thursday, because I had asked a question about it in a meeting and he had noticed.

He was wrong this year and it cost.

There is a piece of paper taped inside the door of the cupboard where the kettle is. It is a photocopy of a photocopy and it shows the storage curves for the three reservoirs for 2015, and somebody has written on it, in marker, *this is what it looks like*.

I have asked four people who wrote it. Nobody knows. It has been there longer than anyone currently on the desk.

. . .

18 July. 3.1% below curve. Within band. Planner's advice to the committee: no change recommended, expected recovery in the second half of August consistent with the record.

1 August. 5.4% below curve. Outside band. Advice unchanged — the August pattern is the August pattern, this is a shape we have seen, hold.

14 August. 8.0% below.

. . .

The thing he had was thirty years of a relationship holding. The thing he did not have was that the relationship is built on a summer that ends when this coast's summers used to end. The last several have not. He knew that better than anybody in the building. He has written about it. He has briefed on it. It is in the plan. And he had it in the model as a widening band rather than a shifted curve.

That is the error, in one sentence. He treated it as more uncertainty around the same expectation instead of a different expectation.

It was reported to him, and that is what I think about. In April a colleague sent him a note about melt-out timing at the upper stations. It asked whether the curve wanted revisiting before the season rather than after. He replied the same day, properly. He said it was a good question. He said he would take it to the winter review, because the winter review is where curve changes go, and because changing a curve in April on one season's data is how you get a worse curve.

Which is the right answer. It is what I would have said, and it is what the process is for.

The cost was that we went to stage three eleven days later than we should have, which is eleven days of demand we did not need to have, on a system that finished the season lower than it has finished any season I have worked. Nothing failed. Nobody was short of water. What we spent was margin, and margin is the thing you have instead of luck.

21 August. Committee. I was in the room for the operations item and stayed for the rest, which you can do and which almost nobody does.

He presented it himself. He did not send a manager and he did not send a slide deck with somebody else's name on the front. He went through the curve, he went through the band, he said the band

had broken on the fourteenth, and he said the recommendation had changed and gave the new one.

Somebody asked him when he had known.

He said the fourteenth.

Somebody asked whether he could have known earlier.

And he said yes.

That is a real answer to give a committee of elected officials in a season the newspapers were already interested in. He gave it in one syllable. Then he waited. There was a pause of four seconds, which I have thought about more than anything else that happened that year. Then the chair moved to the recommendation.

29 August. 9.6% below. Stage three.

. . .

I have been asked twice, by people outside this section, whether he was reprimanded.

The question is not a bad-faith question and it does not have a satisfying answer. For what. He gave the advice the model supported, he flagged the uncertainty in the band, he escalated when the band broke, and the thing he got wrong is a thing that will be got wrong across this sector for the next decade because the record is the record until it is not.

He wrote the post-season review himself. Forty pages. It is unsparing about the model and not at all about him. I read that as evasive at first. I now think it is the correct instinct. A review that is about a person produces a replacement person and the same model.

The curve was revised at the winter review. It moved.

. . .

The Allfather runs the desk on nights and has for as long as anyone here has been employed.

What that means in practice is that his initials are on things. Not decisions — authorities. The standing instruction for the transfer sequence, the after-hours release authority, the stage-two operating note, the seasonal instrument on drawdown. Somebody drafted

every one of those and he signed it, and he signed it before the season it applies to, and the signature is at the bottom of a paragraph somebody else wrote and does not alter.

I have never once seen him decline to sign a thing. I have never seen him ask for a change to one. The question of whether a document should exist is not a question he takes part in; what he does is be there when it needs a name on it.

Handover with him takes longer than handover with anybody else and it is not because he says more. It is because people arrive with things.

An operator coming off days will tell him about an alarm that resolved itself six hours earlier and needed no action and is already written up. Somebody will describe a call they handled in July. I told him, in February, about a set of readings from a season three years before I started, which I had found while looking for something else and had spent an evening on at home for no reason anybody would pay for.

He listened to all of it. He asked one question about the readings, which was what month, and I said March, and he said nothing else.

I have thought since that I went in there wanting somebody to know I had done it. That is the honest version. Nobody else was ever going to.

On the fourteenth of August, at the 0700 handover, he was writing up and I asked him — not formally, the way you ask somebody at a handover — where we were going to end up.

He did not think about it. That is the part I would put first if I were describing him: there was no interval between the question and the answer, no weighing of whether the answer was his to give.

He said 133.4 on the sixth of October.

Nobody says a date. You say a range and a confidence. The tools produce a range and a confidence. The professional apparatus of this job is built around not saying a number and a date. A number and a date is what gets quoted back to you in February.

I wrote it on a sticky note and put it under the edge of my monitor, which is a thing I do with about six numbers a year and which is not a system.

The sixth of October was 133.4.

I have not mentioned it to him. I mentioned it once to somebody else on the desk. She said he has been doing this thirty-odd years, and that after thirty-odd years of the same three reservoirs you would have a feel for it. That is what I would have said. It is probably right. I took the note off the monitor in November when I was clearing things off it.

. . .

6 October. Capilano 133.4 m. First measurable rain of the fall on the eighth. Refill begins.

2 November. Recovering. Ahead of the revised curve, behind the old one.

In the third week of November the newspapers ran the reservoir story they run every November. Storage has recovered. The summer is over. The situation is normal. One of them illustrated it with a photograph of a reservoir that is not one of ours and is in fact a lake near Squamish.

Somebody in communications emailed to ask whether we wanted a correction issued.

There was a short thread. Three people said no on the grounds that a correction would put the story back in front of readers who had already stopped thinking about it. That is the standard position and it is what we always do.

Then the planner replied to all, for the only time in my memory. He said it was a nice photograph. He said the lake in it was ninety per cent full. He said that in the interests of accuracy we should probably mention it.

Nobody knew what to do with that. The thread ended.

I have it. I did not print it out, because I am not a person who prints things out, and I have thought about printing it out.

Cold water

There are three lakes up there that most people in this organization have never seen and could not point to on a map, and I have been to all three in the same week, twice, and it is the best week of my working year.

Burwell. Palisade. Loch Lomond, which is not the Loch Lomond, and which somebody named in a mood I would like to have been present for.

They are alpine feeder lakes, and they sit above the main reservoirs, and they are deep and small and extremely cold, and in the middle of a bad summer we open them and let them down, and that sentence is the operation, all of it, and has taken me eleven years to be able to say without adding to it.

Everybody hears that wrong the first time. We are not doing it for supply. The volume is real but it is not the reason. We do it because the water is cold, and by August the top of a reservoir is not, and warm water in a reservoir is a problem for what lives downstream of it and eventually for what comes out of it.

So: cold water, released into a warm reservoir, in the worst part of the summer, to fix a temperature. There is a supply benefit and it is a by-product and the memo says so.

The memo has said so since 2011 and I have watched it fail to say so in about nine meetings.

“So that’s what, another two weeks of storage?”

“It’s not a storage measure.”

“But it’s water going into the reservoir.”

“It is.”

“Into a reservoir we take water out of.”

“Yes.”

“So it’s storage.”

And there is no way out of that. He is not wrong. Water went in; water can come out. The distinction I am trying to hold is about *why the valve was opened*, and *why the valve was opened* is not a physical property of the water, and by the third exchange I am the man arguing that a volume is not a volume.

What I have learned to do is give it up early and win it later, in writing, where the sentence can be constructed properly. What I have not learned to do is stop trying it out loud first.

The gate structure at Palisade has a hand wheel on it that has been painted eleven times and I know that because somebody counted, in a report, in 1998, which is the sort of document you find when you go looking for something else.

You are not going to hear about these lakes anywhere. They are not in the tour material. They are not on the website in any way that would make sense to a member of the public. There is no photograph of Burwell in a lobby. The three of them together are, in a bad August, doing something for the rivers below the dams that nothing else in the system can do, and the operational memo that authorizes it is a page and a half long and is signed by two people.

. . .

I am a fisheries technician, which is a job title that surprises people at parties, because they hear *water utility* and think pipes, and there are quite a lot of us — biologists, technicians, habitat people — spread across the organization and working on a set of problems that are mostly about the fact that a dam is a wall in a river.

The rivers below these reservoirs are salmon rivers. They were salmon rivers before the dams and they are salmon rivers now, in a reduced and managed and heavily worked-on way, and there is a whole programme about it that has been running for decades and involves us, First Nations, Fisheries and Oceans, and a set of arrangements that predate me.

What I do is counts, flows, temperature, and habitat. Mostly counts.

What people expect, when they hear that a water utility employs biologists, is that we are there for public relations. I understand the

assumption and I would probably make it.

The actual reason is that a dam is a wall in a river, and putting a wall in a river creates a set of obligations that are partly legal, partly negotiated, and partly the plain fact that the fish were there first and the organization has decided what kind of organization it is going to be about that. There are conditions attached to how these systems operate. There are agreements with First Nations and with Fisheries and Oceans that predate everybody currently working on them. There is a set of flow commitments that are as real as any pipe.

None of that is charity and none of it is optics. It is a cost of holding water back, and the organization pays it, and the paying of it is my job.

. . .

The way you get to Burwell is by helicopter, and the way you get to Burwell when there is no helicopter is that you do not go to Burwell.

I have done the walk once, on a training exercise that was really a morale exercise, and it took most of a day and I would not do it again for anything less than the same reason.

By air it is eleven minutes from the pad. I have taken those eleven minutes about forty times and have never spent one of them looking at anything inside the aircraft.

You go up the valley and the valley narrows, and it keeps narrowing past the point where you think it can. Then there is a step — a real one, the ground simply goes up — and above the step there is a bowl, and in the bowl there is a lake the colour of nothing I have a word for.

I have tried, in field notes, where it does not belong. Not blue. Not green. It reads grey from above, and then you are down on the water with your hand in it and it was never grey.

The best I have is that it is the colour of a great depth of very clean cold water, which is not a colour, and is the only description I have that survives contact with the lake.

The infrastructure at the outlet is unglamorous and small and about sixty years old in its bones and has been rebuilt in parts. There

is a structure, there are gates, there is instrumentation, and there is a lot of nothing in every direction.

The work at the lake is a day. Check the structure, check the instruments, take the readings, take the samples, photograph everything, and get out before the afternoon wind. The wind is a real constraint and it arrives on a schedule you can set a watch by in settled weather and does not exist at all in unsettled weather, which is the sort of fact that governs your year.

The pilot is contracted and has been flying for us for years and has a settled view of what my job consists of.

“Fish day.”

“Instrument day.”

“You’ve got the bucket.”

“The bucket is for the samples.”

“You’ve always got the bucket.”

He has never once, in twelve years, referred to anything I do as anything other than fish, including the year I spent almost entirely on a temperature modelling project, which he referred to as fish.

. . .

The release itself is not decided at the lake.

It is decided in Burnaby, off temperature profiles, and the profiles come off a string of sensors that sit at depth in the reservoir and report temperature every metre or so down the water column. In August you can watch a reservoir stratify — warm on top, cold at depth, a sharp transition between — and you can watch the warm layer thicken through the month.

The trigger is what that does to the withdrawal and to the river.

The mechanics of the release are then a question of rate, because you cannot simply open it. Everything about a river is ramping rates. If you change a flow quickly you strand fish, you dewater redds, you move gravel you did not intend to move. There are rules about how fast you may change a flow, and the rules are per-river and are the product of years of argument, and they are the single most important thing in my job that a person outside it has never heard of.

Up how fast. Down how fast. How long you hold. What you do if it rains in the middle.

Palisade and Loch Lomond are not Burwell and I am tired of them being described as though they are.

Burwell is the big one and the deep one and the one with the structure that actually does something at scale. Palisade is smaller and shallower and warms faster and is therefore worth less to me in the exact week I want it most, which is a sentence that took me four years to be able to say out loud in a meeting. Loch Lomond is on the Seymour side and behaves differently again.

Treating three lakes as one resource is how you get a memo that says *the alpine lakes* and an operating decision that averages away the only differences that matter. I have written two notes about this. The second one worked, partly.

. . .

The environmental flow work is the other half and is the part I would talk about all night if somebody let me.

There is a schedule of water that goes back into the rivers below the dams. Not spill — deliberate, scheduled release, for the fish, across the year, and it is a real volume, and in a drawdown year it is a real argument, because that water is also drinking water and somebody has to hold the line on it.

The line has held every year I have been here, and I am aware of how much I complain about everything else.

It holds because somebody argues for it in a room where somebody else is arguing against it, and the person arguing against it is not a villain and is frequently right about the thing he is right about.

His position, which I can state fairly because I have heard it about twenty times: that the flow commitments were set in a set of years that are not these years, that they are a fixed volume against a supply that is now variable in a way it was not, that a fixed obligation against a variable resource transfers the risk to one side, and that the side it transfers to is three million people on taps.

The counter is that a fixed obligation is the only kind that survives a bad August, because an obligation that flexes is an obligation that flexes in exactly the year the fish also cannot flex.

Both of those are true. They are true at the same time. There is no version of that meeting where one of them wins on the merits, and what actually happens is that it gets decided, and the decision has held in my direction every year so far, and I am under no illusion that the arithmetic which produced that is the same arithmetic that will run in ten years.

What that water buys is habitat: wetted area, depth over the riffles, connection between pools, temperature. In a good year it is a background service that nobody notices. In a year like this one it is the difference between a river and a set of ponds.

There is a document that sets out the ramping rates and it runs to a number of pages and it reads like nothing at all. Rates, in centimetres per hour, by river, by season, by starting stage. It is the most boring object in my professional life and I would defend every line of it in front of anybody, because every line of it is a fish that is not stranded in a side channel in August.

It was argued over for years. Some of the arguing was technical and some of it was about water that somebody wanted for something else, and the document that came out the far end is a compromise, and I know which lines I would change, and the lines I would change are the ones where somebody had a better argument than me at the time.

. . .

The counting is the part I get up for.

There is a rotary screw trap in the Capilano below the dam. It is a cone in the water on pontoons, it turns with the current, and juvenile fish going downstream go into it and into a live box, and every morning somebody empties the live box and identifies and measures and counts and releases.

Mostly coho. Chinook. Some trout. Sculpins, which do not count for the programme and which I like disproportionately.

You are up at five. You are in the water at six. In the summer this is the best hour available anywhere and I have never got tired of it and I am sixteen years in.

The count goes on a sheet and the sheet goes into a database and the database is the argument. Everything anybody says in a meeting about whether this programme works is downstream of somebody standing in a river at six in the morning with a bucket and a measuring board.

A morning at the trap, in full, because people ask.

Five o'clock. Truck. Waders in the back that never fully dry between June and September and that everybody in this section has a private opinion about.

Six o'clock, in the water. Two of us — always two, and the second person is not a courtesy, it is a river. Check the cone is turning. Check the pontoons. Check nothing has come down overnight and lodged, because something comes down overnight about once every two weeks in the spring and once a month after that.

Then the live box. You net out, you go to the board, you identify, you measure fork length, you record, you release. A good morning is a hundred and forty fish and takes about two hours. A bad morning is eleven fish and takes forty minutes and is worse, because eleven fish is a data point about the run and forty minutes is not enough time to stop thinking about it.

Then the sheet. Then the truck. Then back for the eight o'clock, at which somebody will ask how it went and will not want the number.

. . .

THE RELEASE, THE DAY OF IT.

The Allfather did it. He does the reservoir side of these — the gates, the rate, the ramp — and the schedule had his name on it three weeks before there was a schedule, on the standing authority that says what a release of this kind may do, which he signed in a year I would have to look up.

I was not at the trap. I asked to be up at the structure and it was allowed, on the basis that somebody from fisheries ought to see the

thing at the end they are always arguing about at the other end, which is a reasonable basis and is not the reason I asked.

What you expect, on any release, is a shakedown. The first hour is always adjustments: the rate is a little high or a little low, the response at the gauge is not quite what the model said, somebody trims it, then trims it again, and by the third hour it is where it was supposed to be. That is not incompetence. A river is a large and lumpy thing and the relationship between a gate position and a stage reading two kilometres down is approximate.

He arrived at ten past six with a flask and the schedule on two sheets of paper and did not look at either again.

There are four of us on that structure for a release: him, an operator, an instrument tech, and this time me, standing where I was told to stand. The radio traffic is the lower gauge calling stage every five minutes and somebody at the plant confirming, and it is the least dramatic sound in the world.

He opened it at 06:40.

What happens next, every time, is the shakedown. The first call from the gauge comes in low or high, and there is a trim, and then the second call comes and there is another trim, and by the third or fourth you are on the ramp. Nobody minds. A river is large and lumpy and the relationship between a gate position and a stage two kilometres downstream is approximate, and the trims are what expertise looks like from outside.

06:45. The gauge called stage. The operator said the number back.

The Allfather did not move.

06:50. The gauge called stage. On the ramp. The operator said the number back and then, after a moment, said it again with a rising tone on the end of it, which is what an operator does instead of asking a question he does not want to be seen asking.

06:55. On the ramp.

By about half past seven the instrument tech had stopped watching the gauge and started watching him, and then noticed me noticing, and looked back at the gauge.

There was no trim. Not a small one. None, across four hours, and I have been on eleven of these and the number has never been zero and has never been under three.

At about ten I said something into the radio — *that's holding nicely*, or near enough — and he said yes, and that was it, and I felt foolish in the way you do when you compliment somebody on a thing they had not understood to be difficult.

The operator, later, at the truck, said he had been doing this since before either of us and that after that long you have the river in your hands. Which is what people say. It is what I would have said. It is what I said, in fact, to somebody who asked me about it in September, and I heard myself say it and did not correct it.

There is a thing that happens at the trap about once a week which is that a sculpin gets in.

Sculpins are not part of the programme. They are bottom fish, they are not going anywhere, they do not belong in a downstream migrant trap, and one gets into the live box anyway, and the correct procedure is to record nothing and put it back.

I have a running count. It is not on any sheet.

“What's this?”

“Nothing.”

“There's four hundred and nine of something.”

“It's sculpins.”

“We don't count sculpins.”

“We don't.”

“But there's four hundred and nine of them.”

“Four hundred and nine is how many there have been.”

She looked at the page for a while longer than the page required and then said — and it has been said to me twice since, by people she has told — “Is this a programme?”

It was at four hundred and nine when I stopped keeping it.

. . .

The temperature string is the thing I cannot account for.

We had a sensor at fourteen metres that had been reading 8.4 for a week, which is what it should read, and it went on reading 8.4

through the release and for three days after, while the sensors above and below it moved the way you would expect cold water arriving to move them. Not stuck at a flat line — it had noise on it, tenths, the way a live sensor does. It simply did not respond to the thing that every sensor around it responded to.

I flagged it. Instrumentation pulled it in the second week of September and bench-tested it and it was fine, and they put it back, and it has behaved normally since.

The disposition on the ticket is *no fault found*. I have read that phrase probably four hundred times in my career and it has never once bothered me and it did not bother me then. Instruments do this. A bench test is a bench test.

The programme is not ours alone. There is a version of this account in which a regional utility is doing conservation on its own initiative and that version is false.

There are First Nations whose relationship with these rivers is not a stakeholder relationship and predates the dams by a length of time that makes the dams look like scaffolding. There is Fisheries and Oceans, whose people I work with constantly and who have statutory teeth we do not have. There are hatchery programmes, and habitat groups, and a set of arrangements about who counts what and who gets the data.

What I do is a component. The component is real and it is properly resourced and I am not being modest about it. But if you removed this organization from the Capilano tomorrow there would still be people counting fish in that river next spring, and that is the correct order of things and I would rather it were understood.

. . .

By the end of September the profile was where we wanted it and the river below the dam was three degrees cooler than the same week the previous year, which is an enormous number in this business and which did not appear in any newspaper.

The count for the season was down on the ten-year mean and up on the last three, which is a sentence I have written before and will

write again, and which means less than the people who ask me about it want it to mean.

I flew out of Burwell for the last time that October on a clear afternoon with the wind not yet up. You go out over the lip of the bowl and the ground drops away underneath you, and there is a stretch of maybe five seconds where you can see all the way down the valley to the reservoir, and then the helicopter turns and you cannot.

The gallery

This procedure applies to entry into the inspection gallery. It is to be read before the entry, at the entry, by the person entering. Do not proceed on memory.

There is a gallery inside the dam. Most people, told that, picture something larger and better lit than it is. It is a concrete corridor running through the structure, it is between eight hundred and nine hundred millimetres wide in the older section, and it is wet, because it is inside a wall with a reservoir on the other side of it, and being wet is not a defect; it is the design working.

1. CONFIRM THE PERMIT IS ISSUED AND IS FOR TODAY.

Confirm the permit is issued and is for today. Confirm the space identified on the permit is the space you are about to enter. Confirm the entry supervisor named on the permit is the entry supervisor present.

I have been doing dam safety inspections for nineteen years and I have never once entered a space on a permit that had the wrong date on it, and I have twice found a permit with the wrong space identified, both times through a transcription error by somebody competent, both times caught at this step, which is what this step is for.

There is a version of this document that is nine pages and a version that is on a laminated card, and the laminated card is the one that gets read, and I was on the working group that produced it and it is the best thing I have been involved in here.

The nine-page version is not wrong. The nine-page version is complete. Nobody reads a complete document at the top of a ladder in the rain.

. . .

2. CONFIRM ATMOSPHERIC TESTING HAS BEEN COMPLETED AND THE RESULTS ARE RECORDED.

Oxygen. Flammable gas. Carbon monoxide. Hydrogen sulfide.

You would not expect an atmosphere problem in a dam gallery and generally there is not one. Galleries are ventilated and there is nothing in there that produces anything. What there is, is a confined space by definition — restricted access, not designed for continuous occupancy — and the definition does not care about your expectations, and the one time in this province that somebody dies in a space nobody expected a problem in, the report says the testing was not done because nobody expected a problem.

Test it every time. Record it every time. Do it at the entry, not at the truck.

. . .

3. CONFIRM THE ATTENDANT IS IN POSITION AND COMMUNICATION HAS BEEN ESTABLISHED AND TESTED.

The attendant shall remain at the entry point for the duration of the entry. The attendant shall not enter the space. If the attendant must leave the entry point for any reason, the entry is terminated and all entrants withdraw.

That is the clause. It is the shortest clause on the permit and it is the one the document is built around.

The attendant does not do anything. That is not a criticism and it is not slack in the system; it is the job. Somebody stands at the top with the log and the radio and the retrieval gear and the list of who is inside, and does not enter, ever, under any circumstances, including and especially the circumstance in which entering would seem obviously correct. The reason a large fraction of confined space fatalities are rescuers is that entering seems obviously correct.

Ours is the Companion.

She has held the attendant ticket longer than I have held mine and I have never seen her do the job badly and I have never seen her do it in a way I could describe. She is there when you go in. She is there when you come out. The log is right.

The scheduling clerk will tell you, if you ask, that gallery entries cluster on certain weeks. She will tell you it is the inspection cycle. It is partly the inspection cycle.

And men talk at that hatch. On the way out, standing there getting their breath, holding the log while she writes. Not about the entry. I have heard a man tell her about a job he did in 1998 that went wrong and was not his fault and was recorded as his, and she said the time, and he said his name, and she wrote it down, and he went and had his lunch.

. . . .

4. ENTER FEET FIRST. MAINTAIN THREE POINTS OF CONTACT ON THE LADDER. DO NOT CARRY TOOLS ON THE DESCENT; TOOLS ARE LOWERED SEPARATELY.

The ladder into the lower gallery is nineteen rungs, original, inspected on its own schedule.

4A. NOTE ON THE LADDER.

Nineteen rungs, original, steel, wet.

The replacement of that ladder has been in a capital submission four times. Each time it has been assessed and each time the assessment has come back that the ladder is serviceable, which it is, and each time it has been sequenced behind something with a higher consequence, which is also correct, and each time the person doing the sequencing has been right and the ladder has stayed.

It will be replaced eventually. It will be replaced in a year when it makes the cut, and it will be replaced by people who will not know it was on the list four times, and nobody will make anything of it.

. . . .

5. CONDUCT THE INSPECTION IN THE SEQUENCE SET OUT IN THE INSPECTION PLAN. DO NOT VARY THE SEQUENCE. RECORD EACH OBSERVATION AT THE POINT OF OBSERVATION AND NOT ON RETURN TO THE SURFACE.

What we are looking at is seepage, movement and cracking, and we are looking at it against a record that goes back to construction.

A dam is not a thing that either holds or fails. That is the public model and it is wrong in a way that makes everything about this job unintelligible.

A dam is a structure with a known and expected amount of water moving through and around it, all the time, forever, and the job is not to stop that, it is to know it. Seepage that is steady is a structure behaving. Seepage that is clear is a structure behaving. Seepage that changes when nothing else changed, or seepage that starts carrying material, is a structure telling you something, and the monitoring apparatus exists to hear a sentence like that early enough to matter.

So when somebody on a tour asks whether the dam leaks, the honest answer is yes, by design, measured.

I have watched a colleague give that answer to a room.

It was a public tour, twenty-odd people, and we were at the crest, and a woman near the front asked it the way people ask it, which is lightly, expecting no.

“Does it leak?”

“Yes.”

You could feel the temperature of that. He did not notice, because he is an engineer of the specific kind who believes a correct answer has done its work by being correct, and he carried on.

“All dams do. You want them to. We measure it in the gallery — there are collection points, we time the flow, it’s been about the same for forty years.”

Somebody said: “Forty years.”

“Yes.”

“It’s been leaking for forty years.”

“Longer. It’s been leaking since it was built.”

At which point a man at the back said, entirely reasonably, “Should we be standing on it?”

What my colleague said next was the correct and complete answer, which is that the seepage is the design functioning, that a structure with no seepage would be a structure whose drainage was blocked, and that blocked drainage is the actual failure mode because it lets pressure build inside the thing. That is right. It is what I would say. It is what I have just said, above, at greater length.

The room did not want it. What the room had heard was *leaking for a hundred years* and then a man explaining, at length, why that was good, and the more competent the explanation got the worse it landed, and by the end of it there were people who had come to look at a lake standing on a dam being told that the water coming through it was reassuring.

The guide got them back. She did it by saying that the dam is inspected more often than any bridge they had driven over that morning, which is true, and which is not an answer to the question at all, and which fixed it completely.

He was baffled. He asked me afterwards what he should have said differently and I said he should have said *yes, on purpose, come and look at the numbers*, in that order, with the *on purpose* attached to the *yes* rather than arriving in the fourth sentence.

He said that was what he had said.

It was not what he had said. It was what he had meant, and he has meant it correctly for thirty years, and there is a version of this trade where meaning it correctly is enough and this is not that version, and I have never worked out how to tell him.

Seepage first. There are collection points along the gallery and each has a measurement — a weir, or a pipe you time a container under, and it is not more sophisticated than that and does not need to be. What matters is not the number; it is the number compared to the number last month and the number in the same month four years ago, and whether it changes when the reservoir elevation changes and by how much.

Then the instruments. Plumb lines, extensometers, piezometers, survey targets, crack gauges. Some of it is read automatically now and some of it is a person with a flashlight and a set of eyes and a form.

Then the concrete. You walk it and you look at it. Nineteen years of walking the same eight hundred millimetres of corridor and you develop a relationship with a wall that I would find difficult to explain to somebody at a dinner party and have stopped trying to.

What you are doing in there, physically, is walking bent slightly forward with a flashlight for about two hours, stopping every so often, and writing on a form with a pencil because a pen does not work reliably on damp paper and I have had that argument and I won it.

The forms are printed on waterproof stock now. That was my one lasting contribution to this organization and I would like it noted that it took two years.

. . .

6. REPORT ANY OBSERVATION OUTSIDE THE EXPECTED RANGE TO THE ENTRY SUPERVISOR BEFORE LEAVING THE SPACE. AN OBSERVATION IS OUTSIDE THE EXPECTED RANGE IF IT DIFFERS FROM THE RECORDED RANGE FOR THAT POINT. THE JUDGEMENT OF SIGNIFICANCE IS NOT MADE IN THE SPACE.

That last clause is the one the following four pages are about, and it is doing more work than its authors intended, because *the judgement of significance is not made in the space* was written to stop an inspector deciding on his own that something was fine. It also stops him deciding that something is not.

Here is the disagreement, and it is not resolved and I am not going to resolve it in this account.

There is a crack in the older section — a real crack, mapped, monitored, with a gauge on it, known since the seventies — and it has been stable for as long as the record runs. Over the last five readings it has moved. Not much. Within the range that the seasonal cycle produces, because concrete moves with temperature and everything in there breathes with the year.

My reading of the five points is that the seasonal pattern has a small trend under it.

The engineer who owns the structure reads the same five points and says the pattern is the pattern, that five readings is not a trend, that we have had this shape before in the eighties, and that if I want to argue for a trend I should say what mechanism I am proposing, because a number moving is not a mechanism.

He has the better of me on the mechanism. I do not have one. I have a shape.

I am also aware that a dam safety inspector who sees trends in noise is a problem for everybody, and that a dam safety inspector who does not raise a shape because he is worried about being the person who sees trends is a much larger problem, and there is no position between those that is comfortable.

The conversation, in the office, the following week:

“Show me the mechanism.”

“I don’t have a mechanism.”

“Then what am I taking to the panel?”

“Five points and a shape.”

“I can’t take a shape to the panel.”

“I know.”

“If I take a shape to the panel they will ask me for a mechanism and I will say a shape and then we will be the dam that saw a shape.”

“I know that too.”

“So what do you want.”

“I want it read monthly.”

And he thought about it for perhaps three seconds and said fine, and that was the negotiation, and I have been in negotiations about a stapler that were worse.

We have agreed to increase the reading frequency and to re-look at it in a year. That is the right outcome and it satisfies neither of us.

Then there is the survey, which is not in the gallery and is not mine, and which I mention because the gallery data is meaningless without it.

The structure is surveyed against monuments outside it on a schedule. Movement of a dam is measured in millimetres per year and the sign of it matters more than the size. What that gives us is the outside view: the gallery says what is happening in the concrete, the survey says what is happening to the structure overall, and the

piezometers say what is happening in the ground underneath, and a dam safety review is somebody senior taking all three together and asking whether they tell the same story.

They have always told the same story here. That is not a small sentence and I am aware that it reads like one.

. . .

7. ON EXIT, REPORT TO THE ATTENDANT. THE ATTENDANT WILL RECORD THE TIME AND CONFIRM ALL ENTRANTS ARE ACCOUNTED FOR. ENTRANTS ARE ACCOUNTED FOR BY NAME AND NOT BY NUMBER.

There is a thing about that gallery that I have never said to anybody in nineteen years.

It is not a frightening place. There is nothing about it that ought to be frightening — it is inspected, it is ventilated, it is monitored more heavily than any other structure this organization owns, and the probability of anything at all happening while I am in it is smaller than the drive there. I know all of that. I have said all of that to new inspectors and I have meant it.

And there is a reservoir on the other side of that wall.

Everyone who does this work knows the sentence and nobody says it, and the ones who say it are usually saying it to see whether you will agree, and you should not agree, because the sentence is not about engineering.

I do not think about it in there. I have never thought about it in there. I think about it in the truck sometimes on the way home and I have wondered, off and on for about a decade, why the inside of that wall is the one place the thought has never come to me.

She is at the top of the ladder when I come out, with the log, and she says the time, and I say my name, and she writes it down.

I brought her a coffee once.

That is not a story and I am telling it anyway. It was February, it was raining the way it rains, she had been at that hatch for two hours and ten minutes in it, and there is a machine in the operations building that produces something coffee-adjacent, and on my way past I got two.

She took it and said thanks and drank it.

What I noticed — and this is why the thing is in here at all — is that I had never done it before, in nineteen years, for any attendant, and that I have done it about six times since, and that four of those were for other people. So somewhere in that February a habit started that I did not decide on, and the person it started with was not the person it has mostly benefited, and I have never mentioned any of this to her because there is nothing in it that would survive being said out loud.

She logs the exit time and she asks the same two questions she asks every time, which are whether anybody else is still in and whether I have my tools.

The tools question is not about tools. A tool left in a gallery is a nuisance. A person who has left tools in a gallery is a person who came out of a space differently from how they went in, and a competent attendant asks about the tools because you cannot ask a man at the top of a ladder whether he is all right without changing what he says.

I have watched newer attendants ask directly. It never works. It gets a *fine* and the *fine* is not information.

. . .

8. THE PERMIT IS CLOSED BY THE ENTRY SUPERVISOR. A PERMIT IS NOT CLOSED BY LEAVING THE SITE, BY THE END OF A SHIFT, OR BY THE COMPLETION OF THE WORK.

The two-person requirement on that entry is in the collective agreement as well as in the regulation, which people find redundant and which is not, because they cover different failures. The regulation says the work requires an attendant. The agreement says who may be assigned as one, what the ticket requirement is, and what happens to the shift when the qualified person is not available.

That last part is the live one. There are not many attendant tickets in the section. When the person with the ticket is off, the work does not happen, and the work not happening is a scheduling problem

that arrives on somebody's desk as a scheduling problem and not as a safety outcome, and it is the same fact wearing different clothes.

I have been in the meeting where somebody senior asked whether we could get more people ticketed. The answer was yes, and it costs, and it is in the budget submission, and it has been in the budget submission for three cycles.

9. FILE THE INSPECTION RECORD WITHIN TWO WORKING DAYS. WHERE AN OBSERVATION HAS BEEN REFERRED UNDER CLAUSE 6, THE REFERRAL IS RECORDED ON THE INSPECTION RECORD WHETHER OR NOT IT HAS BEEN RESOLVED.

Filed. Seepage nominal at all points. Instruments within range. Crack gauge 4B: see attached. Frequency increased to monthly pending review.

PART THREE

TREATMENT AND TRANSMISSION

Barriers

Shift starts at 0600. Handover is twenty minutes and it is never twenty minutes.

I am an operator at the filtration plant. Largest drinking water filtration plant in Canada, which is a sentence that appears in material and is true and does not describe a single thing about the working day.

What the plant does: raw water arrives from two reservoirs through the tunnels. It is coagulated, it is flocculated, it settles, it goes through filters, it goes under ultraviolet light, it is chlorinated, and it leaves. That is the barrier train. Each barrier is for something different and each barrier is sized on the assumption that another one might not be doing its job.

There is a second plant on the Coquitlam side that does it differently — ozone, then UV — because the water is different and the history is different. And there are re-chlorination stations out along the mains, because a long pipe is a long time.

Five barriers. Protected source. Treatment. Secondary disinfection. Monitoring. Certified operators.

The fifth one is a person. That is not a flourish in a brochure. It is in the regulation.

. . .

0612.

“Turbidity’s coming up on the Cap side.”

“How much.”

“Point four. Was point one at midnight.”

“Weather?”

“Sixty-two millimetres up top since yesterday.”

“That’ll do it.”

That is the conversation, all of it, and it is complete. Rain in the catchment moves fine material. Fine material arrives here. The number goes up. Everything after that is procedure.

0640. Coagulant dose up. Filter run times will shorten. Backwash frequency goes up. Somebody will be doing more of them.

0715. Point six.

0902. Point five.

That is a normal event. It is not an incident. It is a Tuesday in November with a number moving. There are perhaps twenty of them a year. It is not an incident because the plant is built for it and the operators have done it before.

. . .

The thing about running a barrier train is that you are never operating one barrier.

You move a coagulant dose and you have changed what the filters see in four hours. You shorten a filter run and you have changed how much backwash water you are producing and where it goes. You change the UV set point and you have changed the electrical load and the lamp life and the maintenance interval.

Nothing is local. That is the skill and it takes about three years and it does not look like anything from outside.

New operators want to fix the number in front of them. That is the correct instinct in most jobs and it is wrong in this one, and unlearning it is most of the first year.

. . .

WHEN IT PLUGS.

A barrier is a thing water has to get through, so the failure mode of a barrier is that water stops getting through it. That is not a disaster and it happens constantly and managing it is a large part of the job.

Filters blind. That is the word. A filter runs. It collects what it is meant to collect. Head loss climbs. At some point it is doing more

resisting than filtering. You take it off and backwash it. Normal run lengths are long. In a turbidity event they get short. Short runs mean more backwashes. More backwashes mean more backwash water. That water has to go somewhere and be dealt with. The somewhere has a capacity.

That is the actual constraint in a bad week. Not the filters. The washwater handling behind them.

Then there is the media itself. Filter media is sand and anthracite in layers and it is supposed to stay in layers. It does not always. You get mudballs. Literal balls of media and accumulated solids, formed in the bed, behaving like rock. The water goes round them. A filter with mudballs in it is a filter with a hole through it that you cannot see. You find them by digging. Somebody stands in a drained filter with a scoop and a bucket, digs a hole, and looks at what comes out. That person is an operator. That is a real day.

Media also leaves. It goes over the wash troughs in a backwash if the rate is wrong, a bit at a time over years, and then somebody measures the bed depth and finds it is not what the drawing says.

The intake screens plug with what is in a mountain reservoir after weather, which is leaves, needles, sticks, and a certain amount of the forest generally.

And there is fouling on the UV side — the quartz sleeves the lamps sit inside get a film on them, because everything in contact with water gets a film on it eventually, and a filmed sleeve is a lamp delivering less dose than the display says it is. There are wipers. The wipers are one of the things that stop working.

None of that is dramatic. All of it is the same fact in different equipment: you have put something in the way of the water on purpose, and the water is bringing things, and the things arrive at the thing you put in the way.

. . .

ON CERTIFICATION.

I hold a Level IV. Water treatment.

Getting one is: verified operating hours, an exam, and continuing education on a two-year cycle for as long as you want to keep it. Not a course. Hours. You cannot buy it and you cannot cram it and there is no version where somebody arrives with a degree and holds one on day one.

The plant is classified by process complexity and the classification determines what level of operator has to be on it. That is the system and it has run in this province since 1966.

I mention it because of what happened in the spring.

. . .

THE ACTING ARRANGEMENT.

Under the agreement there is a mechanism for acting in a higher classification. You do the job, you get the rate, it is temporary, it goes back.

During the job action, acting was withdrawn. That was the point of withdrawing it. Along with overtime and standby.

What that meant on my shift was that the person who normally covers the shift supervisor role was not covering it, because covering it is acting.

The work still had to happen. The plant does not accept that a labour relations process is under way. So the work happened. It happened under a Level IV who was not acting as a supervisor, was not paid as one, and was in every practical sense running the shift.

That person was me for eleven days.

I am not making a complaint. I was not asked to do anything outside my certification and I would have declined if I had been. The job action was legal, the position was one I supported, and the withdrawal of acting is a legitimate instrument, and its effect landing on me is how the instrument works.

What sits oddly is this: my certificate says what I am competent to do. My classification says what I am paid to do. Those are two separate systems maintained by two separate bodies for two separate

purposes, and neither of them knows the other exists, and there are eleven days last spring where the gap between them was the plant.

. . .

1120.

“Where’s this go now.”

“Where’s what go.”

“Filter-to-waste variance. The paper one.”

“That’s electronic since March.”

“There’s a paper one in the binder.”

“There’s a binder.”

That form has a box for a signature from a position that no longer exists. The position was reorganized out in 2023. The form was updated in the electronic system. The paper version stayed in the binder. The binder is on a shelf. About four times a year somebody fills one in.

I have raised it twice. Both times it went to the person who owns document control, who agreed, and who has forty things ahead of it, and both times she was correct that it was forty-first.

The forms get typed in later by whoever finds them. The data is fine. The signature box stays blank. Nothing has come of it. Nothing is going to. An auditor will find it in three or four years and write it up. Somebody will fix it in an afternoon.

. . .

WHAT IS IN A RESERVOIR.

A forest sheds. That is the thing to hold onto. Sixty thousand hectares of coastal rainforest, closed, unmanaged, doing what an unmanaged coastal rainforest does, and a good part of what it drops ends up in the water, because water is downhill of everything.

Whole trees come down banks in a storm and go in. Branches, needles, bark, cones. A reservoir after a big November is a bay full of wood.

That wood then sorts itself out by physics. Some floats and stays floating and collects at the ends of the reservoir where the wind puts it. There are booms. The booms are maintained. Periodically somebody deals with what is behind them. Some of it waterlogs and goes down and sits on the bottom, and some of it — this is the one that people who work on lakes have a word for — waterlogs at one end only and floats vertically, mostly submerged, which is a deadhead, and a deadhead is a hazard to a boat and a nuisance to anything with an opening in it.

The reason none of that is the crisis it sounds like is depth. The intakes do not skim. They draw from well down the water column, through structures with trash racks on them, and the racks are sized for the job and are inspected. Floating wood is a surface problem and the intake is not at the surface. That is not an accident; it is why the intake is where it is.

Animals drown in it.

They do. Not often, and it is not a secret, and I have watched people be startled by hearing it said plainly. Deer, mostly. Bears, occasionally. Small things constantly. A reservoir is a large body of water in a forest full of animals. Animals get into water. Some do not get out. The ones that do not get out decompose in it.

What that means for the plant is nothing that any single instance of it does. It means organic loading, which is a continuous background quantity that the treatment train is sized for and that the coagulation stage exists to deal with, and which goes up after weather and after warm spells and which we watch. One deer is not a number. A forest is a number.

The taste and odour side is the same story from another direction. Warm water, organics, and the things that grow in warm water with organics available, and what you get at the far end is a compound measurable in parts per trillion that nobody's health is affected by and that people can taste, and taste complaints are a real category of work and are not trivial, because a person who does not trust the water buys it in plastic.

So: yes, there are logs in it. Yes, things die in it. There is a building for that, sized on the assumption that both are permanent conditions rather than events.

. . .

TWO QUESTIONS I GET ASKED.

The first is about chlorine, and the answer is that yes, there is chlorine, and the reason is that a pipe is long.

Treated water leaves the plant clean. It then travels, sometimes for days, through hundreds of kilometres of regional main and thousands of kilometres of municipal pipe, into reservoirs and back out. A residual is what keeps it clean all the way along. That is why there are re-chlorination stations along the transmission system: chlorine decays, and by the time water reaches the far end of a long run there is not enough of it left, so you top it up partway.

The trade-off is real and I will not pretend otherwise. Chlorine reacts with organic material and produces by-products. There are limits for those. The limits are why the treatment side works as hard as it does at taking the organics out first. Less organic material in means less chlorine needed and less produced. That is the actual relationship and it is why the barriers are in the order they are in.

There is also pH adjustment, which nobody asks about and which matters more than they would guess. Our source water is very soft and slightly acidic — it is rain off granite through a forest, essentially — and soft acidic water is corrosive to pipe and to household plumbing. So it gets adjusted before it leaves, and that adjustment is protecting people's plumbing and what comes out of it.

The second question is fluoride, and the answer is that there is none in it.

The region does not fluoridate. It has been put to voters here and it has not carried, more than once, over a long period. That is a public health question decided by a public process. It is not decided by me. It is not decided at this plant. I have no part in it and give no view on it.

What I do say, when it comes up, is the plain fact — no, there is not, and if you want to know why not, the answer is in the referendum results and not in the treatment train. About half the people who ask assume I am being evasive. I am being accurate, which sometimes looks the same.

. . .

THE COQUITLAM SIDE.

Different water, and the difference is not a matter of degree.

Coquitlam is deeper. It is a bigger volume relative to what comes out of it, and a deep reservoir with a large volume behaves differently from a shallower one: it is more thermally stable, it responds more slowly to weather, and the water drawn from depth is more consistent week to week than anything on our side. The catchment geology is not the same either. What arrives at that intake is a steadier product than what arrives at ours.

Which is why it is treated the way it is. Ozone, then UV, then chlorine — no filtration stage. That is not somebody's preference and it is not a budget decision. Filtration exists to take out particles and the organics attached to them, and the reason our side has the largest filtration plant in the country is that our side gets the turbidity. If your raw water does not swing the way ours swings, filtration is a very expensive answer to a question you do not have.

Ozone does something filtration does not, incidentally: it is good on taste and odour compounds. Those are the parts-per-trillion things that nobody's health is affected by and everybody can detect.

The other thing about that reservoir is that it is not only a drinking water reservoir, and the story of how that came about is the best thing I know.

New Westminster dammed the outlet in 1892. Small crib dam. Drinking water.

Then in 1904 the power company came. They built a proper dam. They drove a tunnel through the mountain to the next lake over. They put the water down penstocks to a powerhouse at sea level. Switched on at a ceremony in June 1905 with two hundred people at it. They renamed the lake at the far end after the company president. It had been called Lake Beautiful.

At completion that was the longest power diversion tunnel in the world.

Three things about it.

One. The dam leaked. Not a seep — by 1908 they were losing about as much water out of the dam as was going through the tunnel. It took until 1914 to get a second dam built that held.

Two. By 1909 there were dead salmon on the surface in numbers that required a response, and the response was men with pitchforks, sent in regularly, to clear them.

Three, and this is the one. The arrangement was illegal from end to end. Federal law at the time said water diverted out of a watershed had to be returned to it. This water was diverted out of one watershed and put into another one and sent to the sea through a turbine. It ran that way for years.

Nobody I work with tells that story to be indignant about it. It is a hundred and twenty years ago and everyone involved is dead. It gets told because of what it left behind, which is the arrangement we operate under now.

The power company's successor holds the rights to very nearly all of that reservoir's runoff. A third of this region's drinking water comes out of it, closer to half at summer peak. It comes out by agreement. That agreement has been renegotiated and reviewed and is under review again now, with First Nations and federal and provincial agencies at the table.

The generating stations at the far end produce something under half a per cent of the province's electrical capacity.

I am not making an argument. Small generation is still generation and the plants are old and paid for and they run when they are needed. But if you asked somebody to design this from nothing today, and told them a third of a metropolitan drinking water supply was on one side of the scale and 0.4 per cent of provincial capacity was on the other, they would not arrive here.

And my favourite clause of the lot, which is in the operating plan and is not a joke: the tunnel is also used to keep the level up in the lake at the far end, because that lake is a recreation area and people swim in it.

So there is a real sense in which how much water is in our reservoir in August is partly a question about whether the beach is any good.

I have never once heard a member of the public mention any of this.

Coquitlam supplies roughly a third of the region. The three sources are interconnected in the transmission system, which means that depending on where you live and what the operating configuration is that week, what comes out of your tap may be from one source or another or a blend, and may not be the same in July as it was in February.

WHICH BRINGS UP THE QUESTION I GET MOST.

Do we have a preference.

Yes. Everybody does. Everybody in this industry has a view and most of them will not volunteer it, because the moment an operator says one source tastes better it becomes a headline about the other one.

Mine is Coquitlam and it is not a mystery: it is the consistency. Ozone does not leave a signature the way chlorination can and the source does not move much. It tastes like the same thing every time.

That is not a statement about safety. Both are safe. Both meet everything. What I am describing is a preference of the same kind as a preference between two perfectly good loaves of bread.

ON COMPETITIONS, SINCE WE ARE HERE.

There is a world championship. This is real and I did not believe it either.

It happens every February in a small town in West Virginia and it is thirty-six years old and it calls itself the Academy Awards of Water without embarrassment. Municipalities enter their tap water, in the same competition as bottled and purified, against entries from dozens of countries. You fill in a form and pay a fee. Judges score appearance, odour, mouth-feel, aftertaste and taste.

Clearbrook has won it. Clearbrook, in Abbotsford, an hour up the valley from here — best tap water in the world. Greenwood, in the Boundary country, has placed as well. There are municipalities in this province with a medal on the wall of the works yard.

The industry association runs its own, too, at the annual conference: regional winners feed into a Best of the Best, and there is a People's Choice decided by whoever is walking past.

Here is the part I enjoy. The judges' single largest disqualifier is chlorine. If they can taste it, the sample does not place.

Which means a system like ours cannot win. Not because the water is worse — because we are legally obliged to carry a disinfectant residual across hundreds of kilometres of pipe to three million people, and a small system drawing from a well next to town is not carrying anything across anything. The competition rewards the shortest pipe.

I have made that point in a bar to people who did not want to hear it. There is a subreddit for enthusiasts of drinking water, which is mostly young people being cheerful about hydration and is one of the few pleasant places left on the internet, and somebody posted the results there one year and I typed a version of that paragraph and then deleted it, because nobody wants the guy from the utility in the comments.

The channel connects both plants and the transmission system and the re-chlorination stations. You listen to the other side all day.

1340.

“Cap’s at point five and coming down.”

“Coq’s flat.”

“Coq’s always flat.”

“Coq’s flat because Coq’s deep.”

“That’s what I said.”

. . .

The All-Seeing is on the water quality side. Not on shift, not in the operating line, no authority over anything I do. He comes through most days at some point and stands where he can see the raw water panel and does not stay long.

He is in this account early because he is in the building early, and because leaving him to the end of it would misrepresent the shape of a day.

Operators talk to him more than they talk to their own supervisor. That is not a criticism of the supervisor. A supervisor deals with the shift and he deals with the water, and on a bad day the water is the question.

And they tell him things.

I did not notice this for two years and now I cannot stop noticing it. People bring him things that are not questions. A man on my crew told him about a filter he had been arguing about for four years with a series of people who had all left. Somebody else told him, at some length, about a modification she had proposed in 2019 that had gone nowhere and that she still thought was right. I have done it myself. I told him about the binder.

None of that is asking for anything. There is nothing he could do about a filter argument from four years ago and everybody knows it. It is people putting something down in front of somebody who will understand what it was.

He listens. He does not say much. Nothing comes back — no *that's a shame*, no *have you tried*, no offer to raise it. Then he goes. The person who told him carries on with their shift. As far as I can tell they feel better. I could not tell you why.

The exchange is always some version of this.

“What’s it doing.”

“Coming up.”

“How much.”

And then he says a number, and the number is not a reading, because he has not read anything. He does not carry a tablet. I have never seen him at a screen for longer than it takes to walk past one.

What he will do, if you press, is talk about the catchment. Where the rain sat. Which side it came off. What the ground was like going into it. He is completely willing to explain. The explanation is always about the forest and never about the water. I have listened to it perhaps two hundred times. I still could not do what he does with it.

0605. On the floor, with a coffee, not doing anything in particular.

“Cap’ll be up around point four.”

“It’s at point one.”

“It’ll be point four.”

0612. Point four.

I logged the 0612. The 0612 is the instrument. There is nowhere on a log sheet for 0605.

He was gone by 0615. He does not stay to see whether he was right, which I noticed in my second year and have never mentioned.

Everything here has to be defensible. That is regulation, not culture. A decision has an input, the input has a source, the source is recorded, and a year later somebody from the province can pull the file and follow it end to end.

If I move a coagulant dose at 0606, the record says 0612 on the analyser.

The 0600 handover on the raw water side has drifted about ten minutes later over a couple of years. I have never heard anybody say why and I would put money on nobody having noticed.

The floor's account is that the analyser had been reading low at midnight and that the water had been at point four for hours before it said so. That is a completely available explanation, it is the one most people hold, and nobody has ever put a work order on the analyser to test it, because the analyser is not causing anybody a problem and a work order is a thing you raise when something is causing you a problem.

So it stays an account. It will stay an account until the analyser is replaced on its schedule, at which point it will stop being said, and nobody will notice that it stopped.

. . .

1455. Point four.

1710. Point three.

1802. Handover. Twenty minutes. Thirty-five.

Off at 1835. The barrier train did what it does. The number went up and came down. The filters ran short and are running long again. Roughly a billion litres left the plant on my shift. Nobody anywhere thought about it.

That is the job working.

There is no way to make that sound like anything, and I have stopped trying, and the place I stopped trying was a birthday thing in Port Moody a few years back.

“What do you do?”

“I work at the water plant.”

“Oh — like, the sewage plant?”

“The other end.”

“Right, right.” A pause. “Is it bad?”

“Is what bad?”

“The water.”

“No.”

“Because my sister says — ”

And there is a fork in the road at that moment and I have taken both branches and I can report on them.

If you say *no*, *it is fine*, they think you would say that. You are the water man. Of course you say it is fine.

If you explain — five barriers, a protected watershed, the largest filtration plant in the country, a residual carried across the region, twenty-odd thousand tests a year — you have made it into a subject, and a subject requires a defence, and now everybody at the table can hear that the water needed defending.

What I do now is say *no*, and then ask what her sister does. It works every time. It is a small cowardice I have made peace with.

The one exception is children, who ask better questions and do not have a sister.

The connection point

The regional water system ends at a series of points where it stops being ours.

Not physically. Physically it is a chamber with a meter in it and a valve and some instrumentation, and there are a couple of hundred of them, and they are unremarkable to look at and are frequently under a road.

Legally it is the boundary, and the boundary is precise in a way that almost nothing else in this arrangement is precise. Upstream of the connection is Metro Vancouver — source, treatment, transmission. Downstream is the member municipality — distribution, service connections, taps. Two organizations, one pipe, and one point at which responsibility transfers, and the transfer is instantaneous and total and is recorded nowhere except in the agreement that says where the point is.

I look after the meters at those points. Which means that I am, in the most literal available sense, the person who says how much water each municipality has taken, and therefore how much each one pays.

. . .

A connection chamber is not much to look at and I have a professional fondness for them that I do not expect anybody to share.

Concrete box, under a lid, usually in a road and occasionally in a boulevard. Inside: the meter, an upstream and downstream valve arrangement so the meter can be isolated without taking the connection out of service, a strainer in some of them, pressure instrumentation, and a cabinet with the logger in it. Some have a bypass. The older ones have arrangements that were sensible in the year they went in.

The meters are not domestic meters made large. At these diameters you are into electromagnetic and ultrasonic instruments with no moving parts in the flow, which is what you want in something that has to be accurate for twenty years without being taken apart.

Maintaining them is calibration, verification, logger health, comms, and the slow business of keeping a chamber dry enough that the electrical side survives. Chambers flood. Every chamber I look after has flooded at least once, and a flooded chamber is a call-out, and a call-out on a metering chamber is not urgent the way a main break is urgent, which means it is scheduled, which means it is a Thursday.

WHAT A PER CENT IS.

The reason two organizations will spend two years on the accuracy band of one instrument is that the instrument is a cash register.

Metro Vancouver sells water to its members at a rate. The members bill their own residents however they choose. That is a separate matter and is not my business. What is my business is the number at the top of that chain, and the number at the top of that chain is what my meters say.

At a large connection running continuously, a per cent is a substantial annual figure. Not a rounding error, not a nuisance — a real line in a municipal budget, every year, forever, compounding through whatever rate increases arrive in between.

So when an engineer sits across a table and says *it might be reading a per cent high*, he is not being pedantic and he is not being difficult. He is doing his job, on behalf of people who pay taxes to his employer, about an instrument his employer does not own, cannot service, and did not choose.

I have never once thought that unreasonable and I have said so in our own internal meetings, where it was not always the popular position.

. . .

The meeting is the third Thursday.

It is a technical committee. Municipal engineering staff, our people, a standing agenda, minutes. It is not a decision-making body in

the sense that it can decide anything; it makes recommendations to bodies that can. Everybody in the room understands the distinction and everybody in the room proceeds as though the recommendation is the decision, which it usually turns out to be.

Eighteen member municipalities are entitled to attend. Attendance runs eleven to fifteen. The positions in the room outnumber the municipalities present, because two of the larger ones send more than one person and the two people do not always agree, and I have watched that happen and have learned to look at the table.

. . .

THE DISPUTE.

A member has a meter that has been reading high. Their position is that it has been reading high since a rebuild in 2022. Our position, for two years, has been that the meter tests within tolerance.

Both of those are true and that is the difficulty.

The meter tests within tolerance. It has been tested three times, twice by us and once by an independent house at their request and their cost, and each time it came back inside the accuracy band for its class. That is not in dispute and their staff do not dispute it.

Their argument is better than it sounds. Their own downstream metering, aggregated across the area fed by that connection, shows a consistent gap in the same direction over the same period, larger than their losses can account for. A meter can be inside its accuracy band and sitting at one edge of it, and at those volumes an edge-of-band reading is a real amount of money.

That is a good argument, and a meter test cannot resolve it, because a meter test answers a different question.

. . .

WHAT THE MEETING IS ACTUALLY ABOUT.

It is about the fact that nobody knows what the region's water losses are.

We know what leaves the plants. We know, to a reasonable accuracy, what crosses each connection point. Past the connection point it becomes a distribution system with a variable amount of metering on it, and the amount varies by municipality, and in some places it is close to complete and in others it is not.

The regional figure everybody uses is around twenty per cent for members with low metering, and that figure is an estimate with a wide band. The per-capita consumption target the plan runs on is a *gross* figure — everything divided by everybody — because the accurate one is not available.

That is written down. It is in the management plan. Nobody is hiding it.

So a member says their losses cannot account for the gap, and neither of us has a number good enough to test that against.

. . .

WHERE IT GOES.

Somebody asked me once, at a family thing, where the missing twenty per cent goes. I said leaks. That is the answer and it is about right and it is also not the answer, and the actual list is longer than anybody expects and I have been adding to it for years.

Leaks. Most of it is leaks. A joint weeping in a trench nobody has opened since 1968.

Main breaks — leaks that got a decision made about them.

Firefighting: water that did a job and was not metered doing it.

Hydrant flushing, and this one is deliberate. You flush a dead end to keep the water in it fresh, and the water you flush is water you treated.

Water quality flushing generally. Same principle, larger volume than people think.

Street cleaning.

Sewer flushing. Drinking water, used to clean sewers. I enjoy telling people about that one.

Park irrigation — some metered, some on a line somebody put in during the seventies that is on no plan.

Pool filling. Ice rinks. Ice rinks are a real number in this region, they are seasonal, and they are visible in the data if you know to look for them.

Construction water. Some permitted and metered, some a contractor with a hydrant wrench who has decided that a hydrant is a tap.

Under-registration: meters reading low at low flow. A physical property of certain meter types and not anybody being dishonest.

Reservoir overflow. Rare, and embarrassing.

Theft — a small number that people are disproportionately interested in.

And a box on the form headed *unaccounted for*, where everything above goes when you cannot put it anywhere else, and which is therefore both the answer to the question and a restatement of it.

I have given that list at three dinner parties. Twice it went well.

. . .

THE EXCHANGE.

Their engineer, who is good and who has run this argument for two years without once losing his temper, put it plainly.

“Can we agree the meter might be at the top of band.”

“It might be.”

“So it might be reading a per cent high.”

“It might be reading a per cent low.”

“It isn’t reading a per cent low. My data says which direction.”

“Your data has an error band wider than a per cent.”

“So does yours.”

“Yes.”

A pause of about three seconds, and then he laughed, and then two other people laughed. It was the only laugh in a two-hour meeting and it was the correct response.

WHO WORKS WHERE.

There is a labour market that runs across the connection point in both directions and it is smaller than you would think.

Regional is one employer. The eighteen members are eighteen more, each with its own works department, its own agreement, its own union — mostly CUPE locals on that side, and on ours an independent union that has been independent since 1946 and is not affiliated with them.

So a distribution operator in a member city and a transmission operator here are doing adjacent work on the same water on either side of a chamber, and are in different unions, on different agreements, with different rates, different classifications and different seniority lists.

People move. Constantly, and in both directions, and for the reasons people always move: money, shift, commute, a supervisor, a posting that came up. There is a man on my own crew who did eleven years with a member and came here, and there are people who went the other way, and one of them sits opposite me at the third Thursday.

What moves with you is the certificate. Operator certification is issued by an external body against process complexity and it is yours — it does not belong to your employer and it does not reset when you change one. What does not move is everything else. Seniority does not move. Classification does not move, because the classifications are not the same words. Pension is a conversation with somebody in an office.

So the industry's competence is portable and the industry's rewards are not, and a person with twenty years of certified hours starts at the bottom of somebody's list on a Monday.

The other thing, which took me a while to appreciate, is that our own rates have historically been tied by agreement to what a particular member city settles with its own workers. A parity provision. Which means the people running the region's water have had the value of their work established somewhere else, in a negotiation they were not in, between two parties who were not thinking about them.

Nobody on either side finds that strange. It has been that way a long time, it produces a defensible outcome, and the alternative is arguing it from first principles every three years, which is worse.

It comes up at the third Thursday about once a year, sideways, when somebody mentions a vacancy nobody can fill.

. . .

THE OTHER THING THAT HAPPENS IN THAT ROOM.

Two of the larger members send more than one person, and the two people do not always agree, and when they do not agree the room becomes briefly fascinating.

It is not a factional thing. It is that a utility manager and a finance person from the same city have different jobs, and the utility manager wants the parallel trial because it produces information, and the finance person wants a position on the invoice in the meantime and does not want to have paid two years of disputed billing while everybody gathers data.

“We’re not proposing to withhold.”

“We’re not proposing to withhold *yet*.”

“That’s — ”

“I’m agreeing with you. I’m agreeing with you and saying the word *yet*.”

That went in the minutes as *the member noted that the billing position remained under review*, which is a fair summary and is not what happened.

Minutes are like that. I have read four years of them and I can tell you which meetings were difficult and I cannot show you where.

. . .

WHAT WAS DECIDED.

A twelve-month parallel metering trial at that connection. A second meter of a different technology installed alongside, both read, both logged, and a comparison at the end.

That is not a resolution. It is an agreement to have better information in a year.

Somebody senior from our side — she chairs, she has been doing this longer than anybody in the room, and she says perhaps forty words in a two-hour meeting — closed it out.

She said the trial should also record the flow profile and not only the totals, because the two technologies behave differently at low flow and at night, and that if the gap is a low-flow gap the totals will show a discrepancy and not show why, and then everybody would be back here in a year with the same argument and a better number.

Nobody had raised flow profile. It was the best thing said in the meeting by a distance and it added eleven words to a scope.

. . .

The Conscience-Keeper is the reason I now read agreements, and I should explain what he does before I explain what he did.

The water supply agreements are the documents that say what a member is entitled to take, on what terms, at what point, measured how, and what happens when any of that is in dispute. There is a master agreement and there are the specific ones and there are amendments going back decades, and taken together they are the reason this system is a system rather than eighteen arrangements.

He looks after them. Not the engineering. The instrument.

The section he sits in also does the permits — the ones that govern what a member may connect to the regional system and on what conditions — and he attends this committee for the items where the two touch. That is more items than the agenda usually admits.

What he does in a meeting is very little, and what he does is stop it.

Not often. Perhaps twice a year. The room will be forty minutes into something and he will say *no*, once, at ordinary volume, and the room will stop, and then he will say nothing further and the room will start again somewhere else. He does not supply the alternative. He removes the thing that was being built and does not replace it.

I have watched a chair try three times to get him to say what the objection was. He does not have one in the form a chair can use. The objection is the stop.

Before this meeting, in the corridor, papers still in a pile, nothing open, he stopped me mid-sentence about the meter and said the dispute was not about the meter.

Not accuracy. Not tolerance. He would not say what it *was* about, and I want to be accurate here: he did not decline, he simply had nothing after the negative.

Two hours later the room agreed a trial that will produce a number in twelve months. The engineers argued instrumentation because the dispute presents as instrumentation, and I argued instrumentation with them, and I am the meter man and would argue instrumentation at my own funeral.

I went looking afterwards on my own time for whatever it was he had refused, which took a while, because the agreement is long. It is in a part about procedure.

It says, in effect, that once a measurement has been taken and recorded in the manner set out, it is the measurement, and it is the measurement whether or not a party subsequently forms a different view about the instrument. There is a route to challenge it and the route has steps and time limits and a threshold, and none of the steps is *install a second meter and see*.

So the trial will produce a number in March, and the number will be information, and what it will not be is a measurement in the sense the agreement means. Somebody will have to decide what to do with an authoritative twelve-month dataset that has no standing.

I raised it internally. It went on a list.

When the minutes came round the corridor was not in them, because a corridor is not in minutes. What is in them is the trial, the flow-profile amendment, and the attendance list. His name is on the attendance list and there is no item against it.

The other thing about him, and I have watched this happen to four separate people including me, is that members bring him grievances that are not his.

Not disputes. Grievances. The engineer from the meter argument caught him at a coffee urn once and told him about a boundary

decision from 2011 that had gone against his city and that he still considered wrong, and it had nothing to do with agreements, or permits, or anything in that man's remit, and it was fifteen years old and unappealable and everybody involved has retired.

He heard it out. He said, at the end, which body had taken the decision. Not that it was right. Not that it was wrong. Which body.

The engineer thanked him. I watched it and I could not have told you what for.

. . .

AFTER.

The trial meter went in on a Wednesday in March. It took most of a day. There is a chamber under a road, and there is traffic control, and there is a confined space entry, and there is a bypass arrangement that has to be agreed with the municipality in advance because you cannot take a connection out of service without telling the people on the other side of it.

I was there for the commissioning read. Both meters, same minute, both logging.

The difference on that first read was 0.3%.

That means nothing. One read means nothing; the point of the trial is twelve months of reads and a profile. I recorded it and drove back and put it in the file, and the file will sit until March.

The next item on my list that afternoon was a chamber lid on the Coquitlam side that has been reported twice as sitting proud of the road surface, and I went and looked at it, and it is sitting proud of the road surface.

The tunnels

I did twenty-six years on transmission, most of it underground, and I am going to tell it the way we told it in the trailer at half seven in the morning, which is out of order, with the good bits first, and with somebody interrupting to correct a date that does not matter.

The good bits are the tunnels, and I will come back to the tunnels, but you have to understand what the region thinks the water system is before the tunnels mean anything, and what the region thinks the water system is, as far as I can tell from thirty-odd years of being asked at weddings, is a pipe under a road and a bill.

Everybody knows there is a plant, because the plant was in the news when it was built and it cost what it cost. Some people know there is a reservoir, which they will usually place in the wrong valley. Almost nobody knows that the water off the Capilano side does not travel round the mountain the way you would assume water travels, because water travels downhill and around things, and this water goes *through* — into a hole we drilled, under the mountain, out the other side, into the plant, treated, and then back under the same mountain in a second hole to come out where it started, which is not where it started, because everything about it is different by then except the location.

Two tunnels. Seven kilometres apiece, near enough. Raw water one way, treated water the other, and one plant doing the work of two because at some point somebody sat down and worked out that a hole through a mountain is cheaper than a second plant, and was right, and I would very much like to know what that conversation sounded like, because *we will put it through the mountain* is not a sentence you say lightly in a meeting.

I did not build them. I was maintenance and I came along afterwards, which everybody who builds a thing thinks is the lesser half of it, and which is wrong, because you get to know a thing by looking

after it in a way that you never get to know it by putting it in. The men who built those tunnels saw them once, empty, dry and lit, and then they went to build something else. I have been in them more times than I have counted, in every condition they come in, and I would put what I know about the inside of those against anybody living.

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THE TRADE.

Millwright.

It is a real trade with a real ticket, and people mishear it constantly, because the word sounds like it belongs in a mill, and in this province half the people who hear it assume sawmills, which is fair, and which is where a lot of them are, and which is where I would have ended up if a man I met at a bus stop in 1996 had said something different to me.

The formal name is industrial mechanic. Four-year apprenticeship, four levels of technical training with work time in between, a set number of hours signed off, and then the interprovincial exam and a red seal on the ticket that means you can work in any province in the country.

What it covers is machinery. Installing it, aligning it, maintaining it, and taking it apart when it stops. Bearings, seals, shafts, couplings, gearboxes, hydraulics, pneumatics. Alignment is most of the difference between a good millwright and a poor one, and it is the part nobody watching you will ever see. A pump and a motor out by a fraction of a millimetre will run, and will sound fine, and will eat bearings for four years until somebody works out why. Learn to do it properly the first time and you will be believed about everything else.

What it does not cover matters as much, because a crew is a set of tickets and the lines between them are real. A millwright does not do the electrical. An electrician does. A millwright does not weld the pressure work — that is a pressure welder with a stamp and a procedure and a coupon somewhere in a file. A millwright does not

do the pipefitting on a new install. Those lines exist partly because of the agreement and mostly because a person who is qualified for a thing is qualified for that thing, and I have never once resented one of them, and the crews I have seen come apart were crews where somebody thought the lines were suggestions.

In transmission, what all that lands on is valves, actuators, pumps, gates, couplings, and whatever is inside a chamber that has decided to stop.

Here is the thing you will not be told, and you will work it out in about a year, and I am going to save you the year: a water main is not a pipe. It is a system with things in it, and the things are what go wrong. A pipe will sit in the ground for eighty years and be fine. A valve will not. A valve has moving parts and a seat and a stem and a gearbox, and it lives in a wet chamber, and it gets operated four times a decade, and the fourth time is the one where you find out.

Most of my working life was going to look at something that had been fine for eleven years, and was fine on the eleventh, and was not fine on the day I got there, and there is no way to know from a desk which of those three you are driving toward, and you will drive toward all three, and you will not be able to tell the difference until you are standing over it.

. . .

ON THE PHRASE.

We used to say a thing was *in the dry*.

It meant the water was off it and it was safe to open. It is not a term anybody outside would use and I have never seen it written down and I have used it a few thousand times.

I got it from a man called Bert who was on the crew when I started, and he had it from the crew before him, and I asked him once where it came from and he said he did not know and had never wondered.

I have said *in the dry* to men who were born after Bert died. Two of them said it back to me. One of those two is now a supervisor and I would put money on his crew saying it.

That is the sort of thing that gets carried and it does not get carried on purpose. Nobody hands it over. You say it in front of somebody enough times while doing something they are paying attention to and it goes in.

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SECOND NARROWS.

There is a tunnel under the inlet at Second Narrows. Sixty metres down.

That crossing had been on mains that were old and that crossed at a place that was not where you would put a crossing if you were doing it now, and there had been a plan to replace it for as long as there had been people planning things.

Sixty metres is deeper than people picture. You go down a shaft. It takes as long as it takes. And you come out at the bottom into a tunnel that is dry and lit and is under a body of water that ships go across.

I went down that one perhaps a dozen times and never got over it. Not the depth. The quiet. There is a specific quality of quiet underneath sixty metres of ground that I have not found anywhere else, and the closest I can get to describing it is that it is not a lack of noise, it is the absence of the possibility of noise.

That got built. It works. It has been in the ground for years now doing the job it was put there for. If you stopped a hundred people on a street directly above it, I would be surprised if one of them knew.

The other one is Stanley Park — the First Narrows crossing — which came in more recently and which did a specific, measurable thing to the summer restrictions in the year it came on. That got built too.

And there is a Coquitlam project coming, to double what can be drawn and treated and moved off that source. Late this decade into the late thirties. That has not been built and will be built by people who are currently apprentices.

Three of those. Delivered, delivered, and coming. On the water side. I have not read a newspaper article about any of them.

HOW A CREW ARRANGES ITSELF.

Before the permits, one thing about how the work actually gets planned, because it bears on everything after.

A crew builds a job around what it has got. That is not a philosophy, it is a schedule. You look at the list, you look at who is on, and the shape of the day comes out of that. Two people who have done a job before will do it a way that a different two will not.

The heavy lifts went where the Hand was. Not by anybody's instruction. There is no line in any procedure that says so and no supervisor ever wrote it down. But if there was a lift on the Thursday list and he was on the Thursday, the lift stayed on the Thursday, and if he was not, it had a way of moving.

I have been asked about this once, by a planner doing an efficiency review, who had found it in the data and wanted to know what the driver was. I said scheduling. She wrote down scheduling.

PERMITS.

Here is a thing that took me the better part of a decade to stop finding funny.

We are the regional water utility. We supply the water. To do work on our own main, in a road, in a member municipality, we apply to that municipality for a permit.

Which is correct. It is their road. Roads are municipal, and a regional body opening a municipal road without asking would be a regional body that does not last long. But there is a specific comedy in filling out a highway use application for a city so that you can go and fix the thing that gives that city its water.

The permit is the start of it. On any job of size you also have:

Traffic management, which has to be designed and approved and which frequently costs more than the work in the hole. Working hours, which are set by a noise bylaw and which are not the hours you would choose for a job that has to be back in service by morning. Tree bylaws, because a chamber near a boulevard tree is a conversation with an arborist. Utility conflicts — gas, hydro, telecom, district

energy in some places — each of which has to be located, and each of which has its own locate turnaround, and one of which will be somewhere other than where the records say. Archaeological requirements. Environmental windows, particularly anything near water, which is most of this region. First Nations consultation, at a level set by the work and not by us. Provincial approvals depending on what you are crossing.

And a third party or two — a railway, a highway, a port — each with its own crossing agreement, its own flagging requirement, and its own view about your schedule.

None of that is obstruction. Every one of those exists because something went wrong once. But the honest description of a large water project in this region is that the engineering is the straightforward part, and that a competent utility is one that has people whose entire job is the other part, and we have those people, and I could not do what they do.

The one that gets everybody is the schedule. A member's council has a meeting cycle. A meeting cycle is not a construction season. There are jobs in this region that are done in a particular year because that is the year a report got on an agenda.

. . .

We had a valve to change out at depth. Big one. Not the biggest I have been near and big enough that it goes down the shaft on a crane and there is no version where anybody handles it.

The problem with a load in a shaft is that a shaft is a hole with sides. You have a load on a hook coming down a fixed distance into a space that does not have room for the load to be in the wrong place, and it has to arrive on a set of bearers that are maybe a hundred millimetres wider than the thing on each side, and it has to arrive with the flange orientation right, because if it lands rotated you are turning it in the hole and turning a load like that in a hole is how people get hurt.

Standard practice is you land it near, you set it down, you get the bars in, and you walk it across and round. That is a good half hour

with four people and it is what everybody does and there is no shame in it, and I have done it two hundred times.

The Hand was on the tags.

He said it would come down on the bearers, square, and would not need moving.

It came down on the bearers, square. Flange orientation right. We put a bar on it out of habit and there was nothing to do with the bar.

The crane operator got the credit for it. He took it, and he was entitled to take it, because a load lands where the crane puts it and he had put it there, and he bought coffee at the top on the strength of it.

There was one man on his second week on that crew who did not know it was unusual, and I did not tell him, because you do not tell an apprentice a thing is unusual. You let him see the ordinary version four hundred times and he works out on his own which one was not.

He is a supervisor on the Coquitlam side now. I have never asked him whether he worked it out.

. . .

WHAT IT IS LIKE.

You are wet for most of a career. Not soaked. Damp, from a chamber, on a Tuesday.

The day starts at the yard in the dark for a good part of the year. Coffee, the board, who is on what. Then the tailboard, which is the crew standing round the tailgate or the table going through the job — what it is, what the hazards are, who is doing what, what the plan is if it goes sideways. Everybody signs it. That is not paperwork theatre; the signing is the bit that makes people listen to the part before the signing.

Then you are in a hole.

That is the honest summary of the work. Chambers, mostly. A chamber is a concrete box in the ground with a lid on it, and the thing you have come for is at the bottom of it, and getting to the thing means gas testing, ventilating, a permit, an attendant, and a

ladder. Confined space, every time, whether it feels like one or not. Some of them are big enough to stand in. Some of them are not, and you work on your knees in twenty centimetres of water with your back against a wall and a valve stem in front of your face, and you are there for three hours.

Traffic is the other constant. Most of this work is in a road, which means most of this work happens with the public going past at fifty centimetres and forty kilometres an hour. You get used to it and you should not. Every crew I have been on has a story about a vehicle coming through cones, and every one of those stories ends with everybody being fine, and the reason I know that is that the ones that do not end that way do not get told as stories.

The public talk to you. Constantly. Somebody will want to know how long, somebody will want to know why here, somebody will want to tell you about a pressure problem at their house which is genuinely useful information and which I have passed on more than once. And somebody, on most jobs, wants to know whether you are digging up the road again, and the honest answer — that this is a different utility from the one that was here in March — never lands.

The truck is not a truck.

They are built for us — aluminum bodies on a stripped chassis, and they come in as a cab and a frame and go out as a workshop. Bench along one side. Vice. Drawer units, and the drawers are laid out the same in every truck in the fleet so that a man from another crew can find a spanner in the dark, which is not a hypothetical. Compartments down both flanks. Power, air, lighting, a rack up top for pipe and bars and the long stuff, and every bit of it specified by people who do the work rather than by a catalogue.

A well-set-up crew truck is a tool crib that arrives. It is the difference between a job and a job with two trips back to the yard, and the two trips back to the yard is how a four-hour outage becomes a seven-hour outage and how a member municipality's engineering department gets a phone call.

Then there are the trailers, which are the same idea and larger. Aluminum, custom, and they are workspace rather than storage. Table down the middle, benches, lighting, heat, room for eight or ten. You do the morning brief in there. You lay the schematics out

flat — properly flat, not folded over a tailgate in the wind — and you walk the job on paper before anybody opens anything. Planning, tailboards, the argument about the sequence, and then lunch, at the same table, off the same drawings, with somebody's boot on the bench.

That trailer is where the actual thinking on a job happens. I have watched a job get taken apart and rebuilt on that table in twenty minutes by four people, and then go the way they said it would go.

You eat in the truck. You learn every place in the region where you can get a coffee at half five in the morning and you learn them in a specific order that is about where the work is that month.

The best part is the callout. That is not the standard view and most people would not say it. But two in the morning on a main break, with the road shut and the lights up and eight people who all know what they are doing, and nobody talking except about the job — I have never had anything else in my life that was that clean. Everybody wants the same thing. Nobody is managing anybody. It gets fixed or it does not and you find out.

What nobody tells you about a callout is the noise.

There is a generator for the lights. There is a pump running continuously because the hole fills, and if the hole is bad there are two. There is a compressor if there is breaking to do. There is a vac truck, and a vac truck at working revs is the loudest object most people will ever stand beside. All of that is going for six hours in a road cut with concrete on three sides of it, and you are in the bottom of it, and everybody is shouting because everybody has to.

Then it all stops at once and somebody is talking to you at a normal volume and you get about one word in three.

You go home at nine in the morning and you cannot sleep and you sit at the table with a cup of tea and the ringing, and it goes off by about two in the afternoon, and it went off a bit slower every year I did it. I have had the test. It is what you would expect and it is not compensable and I would do it again.

. . .

THE END OF IT.

I did twenty-six years and then I went to collection.

There is a reason and it is not interesting: I got a shoulder done, the transmission work has more overhead in it than people think, and there was a posting.

The last thing I did on transmission was a valve exercise programme. Going round operating valves that had not been operated, on a schedule, writing down what happened. Not repairing anything. Just turning things to find out whether they turn.

I did two hundred and eleven of them over about five months. Eleven of the two hundred and eleven did not turn properly and went on a list.

That list is why somebody in 2029 will open a valve in an emergency and it will open, and nobody will know that it opens because a man with a bad shoulder turned it in a chamber in the rain four years earlier and wrote it down.

Bert would have said that was the job. He said a lot of things were the job. He was mostly right.

PART FOUR

COLLECTION

The lateral

Quarter to six and the yard is dark and the kettle is going.

Four of us today. Trunk entry. A line with a flow monitor that has stopped reporting. Could be the monitor. Could be the bracket. Could be something sitting on top of it. No way to find out from a desk.

Tailboard at the tailgate. Crew lead runs it. What we are doing, where, what is in there, what the atmosphere is likely to be, who is entering and who is attending, where the truck goes, where the exclusion zone goes, what we do if the monitor reads and what we do if a person goes over. Everybody signs.

Bump-test the gas monitors off the bottle. Four gases. You do it in front of each other, and it takes ninety seconds, and nobody has ever skipped it on any crew I have been on.

Traffic control shows at six ten. Cones out by half past. Lid off at twenty to seven.

. . .

The atmosphere test comes back clean and stays clean, and the fan goes in anyway, because the permit says the fan goes in.

I go down. Two of us in, two up top, one of them on the log with the tally board and the retrieval gear.

Standing in it, the first thing is the sound. A trunk sewer at seven in the morning is loud. A lot of water, moving fast, in a concrete tube. It does not sound like a stream. It sounds like a machine.

The second thing is that it is warm. It is always warm. Fourteen, fifteen degrees in February when it is three above ground. A region's worth of hot water goes down drains and arrives here about an hour later. It has not had time to cool. In February you come out of a hole into cold air with steam coming off your kit.

Then the light on the walls and what is on them.

. . .

Wipes.

That is the answer to what is in there, and it is the answer everywhere in the country, and it will be the answer for the rest of my career.

They are sold as flushable. *Flushable* means it goes down. It does not mean it goes away. A thing that is flushable in the sense the packet means is a thing that will clear a toilet trap and then be somebody else's problem four hundred metres downstream, and I am the somebody else.

What they do is find each other. One wipe is nothing. Wipes plus grease build a rope. The rope catches a rag. The rag catches a stick. The stick catches everything after that. In a month you have a mass on a bracket the size of a rolled carpet.

Grease comes in from everywhere and hardens on the wall at the waterline where it is coldest. You can read the flow history off a wall like tree rings if you have got nothing better to do while the pump runs.

Grit is the quiet one. Sand, road material, glass, the general mineral fraction of a city. It sits on the invert. It takes up capacity. It eats pumps from the inside. There is nothing amusing about grit.

Then the objects, which is the category people ask about at barbecues. Everything you have heard is true. I am not going to list them.

. . .

The monitor bracket has a rope on it. Of course it has a rope on it.

The Hand gets it off.

He does not gear up for it and he does not brace himself and there is no moment before. Arms in past the elbow. A purchase on it. Side to side twice. Out in one piece, the way a root comes out.

I have my arms in it too, on the other side of the bracket, breathing shallow through the mouth and thinking about lunch on purpose.

He is talking while he does it. Not about this. About a road closure.

The crew lead says the bracket is clear and asks for the monitor to be checked before we come up. I check the monitor. It reports.

. . .

Half seven and we are out and the fan is out and the lid is back on and the cones are coming in.

RUTH.

There is a traffic control person on every job in a road and on most crews they are furniture. You arrive, they are there, the cones are out, you work, you leave.

Ruth has been doing it twenty-two years. She was on our lid at twenty past six in February and she is on it again in April and she remembers the February one, including which of us went down.

I ask her, because it is raining and the pump is running and there is nothing else to do, what the worst job is.

“Gas.”

“Why gas?”

“Because a gas crew’s got a leak. A leak’s got a clock on it. Everybody moves faster than they should and nobody tells me anything.”

“And us?”

“You’re all right. You’re slow.” She thinks about it. “You’re the slowest.”

“Is that a criticism?”

“It’s a fact. Water’s slow, sewer’s slower. You do a lot of standing round a hole talking about the hole.”

That is not wrong.

She has, in twenty-two years, worked for every utility in this region, three levels of government, the railway, the film industry, and more contractors than she can name. She has watched a few thousand crews do a few thousand jobs from a fixed position, eight hours at a time, with nothing to do but look at them.

She has views.

“Who’s good?”

“You want me to say you.”

“I want you to say whoever.”

She gives me three outfits. Two of them I would have said. The third is a small paving contractor I would never have thought about, and when I ask why, she says because they set up properly and they clean up properly and they tell her the plan before they start and again if it changes.

“That’s it?”

“That’s the job. If I know the plan I can keep people off you. If I don’t, I’m guessing, and when I guess I get it wrong, and when I get it wrong somebody walks through your work.”

Then she tells me about the driver.

Every one of them has a driver. Hers was 2011, a woman on a phone who came through the taper at forty-something and missed her by about the width of the truck she was standing beside, and she describes it in one flat sentence and does not embellish it and does not want anything from me for having said it.

“Did she stop?”

“She stopped down the block. She was crying. I didn’t go down.”

“Why not?”

“Because my job was the cones.”

. . .

WHAT THE PUBLIC BELIEVES.

There is a set of beliefs about this system that I encounter in some form most weeks, and I have stopped correcting most of them.

That it is one big pipe. It is about fourteen thousand kilometres of it, every diameter from a hundred millimetres to something you could drive a car through, in three ownerships, of six or seven materials, laid across a hundred and twenty years.

That everything ends up at one place. There are five plants and the one your street goes to depends on which side of a boundary you are on, and the boundaries are not the municipal ones.

That there are alligators. I have been asked about alligators.

And the persistent one, which is that somebody is looking at all of it. Most of that pipe is looked at when there is a reason to look at it.

. . .

SMOKE.

The afternoon is inflow and infiltration, which is the thing that keeps this system awake at night. A sanitary sewer is supposed to carry sewage. Rain is supposed to go somewhere else. Rain gets in anyway — through cracks, through bad joints, through manhole covers in a low spot, and through things that people have connected to the sanitary system on purpose because it was the pipe that was there.

When it rains hard the flow in a sanitary trunk can multiply several times over. That water gets treated at the far end at the same price as everything else. If it is enough water it comes out somewhere it should not.

You find the connections with smoke.

You put a blower on a manhole and push a non-toxic smoke through the system. It goes where the air goes. The air goes out of every opening the system has. Then you walk the ground with a camera and you write down where smoke comes out.

Some of it is expected. Vents on roofs — that is the system breathing and that is correct.

Some of it is not.

. . .

Two forty-five, and there is smoke coming out of a lawn.

That is a cracked lateral, and it is on private property, and it is a letter and a conversation and eventually somebody's plumber. Photographed, logged, moving on.

Three ten, and there is smoke coming out of a downspout.

That is a roof drain into the sanitary. Somebody's roof, every millimetre of rain that lands on it, straight into a pipe built for what a house produces. That is the finding of the day and it goes in the report and it is precisely what we are out here for.

Three twenty, and there is smoke coming out of a kitchen.

. . .

The kitchen is a problem because there is a woman in it.

She comes to the door quite fast. Smoke has come up through a floor drain in her laundry area, which is directly off the kitchen, and it has done that because the trap in that drain is dry, and it is dry because nobody has run water into that drain since about 2019.

“There’s smoke in my house.”

“There is. It’s ours. It’s not hot and it’s not toxic.”

“It’s *smoke*.”

“It’s a testing smoke. It’s mostly water. Can I show you where it’s coming in?”

And she says yes, because she wants to know, and we go and look at the floor drain, and I explain the trap, which is the U-bend in the pipe underneath it that is supposed to be full of water, and the water in it is what stops the sewer being connected to her laundry room by air.

“So there’s a hole in my floor that goes to the sewer.”

“There is a drain in your floor that goes to the sewer. There’s supposed to be water in the bend.”

“And if there isn’t?”

“Then it’s a hole in your floor that goes to the sewer.”

She looks at me.

I tell her the fix, which is that she pours a jug of water down it, now and then, forever. She asks how often. I say every couple of months. She asks what happens if she forgets and I say she will smell it and remember.

Then she asks the question everybody asks, which is whether this is normal, and I say that dry traps are extremely normal and that this is why we do the test, and that she has now got the best-maintained floor drain on the street.

She is pouring the jug as we leave. Her husband has come out to the driveway to ask what the smoke was and she tells him before I can, and gets the trap explanation right, better than I gave it.

. . .

There is a thing the smoke test does that is not on the report.

The blower runs for about forty minutes and in that time the neighbourhood works out that something is happening and comes out. Not everybody. Four or five doors on a street.

They ask what we are looking for and I tell them, and about a third of them then tell me something. A basement that smelled last October. A gurgle in a toilet when the washing machine drains, which is a real diagnostic sign and which I write down. A neighbour's downspout that somebody has had an opinion about for six years.

Very little of it is useful and some of it is extremely useful and there is no way to tell which is which at the door. The gurgle went on the list. The gurgle turned out to be a partial blockage in a municipal main two properties along, which nobody would have found for another year.

Nobody tells us any of this at any other time. There is a truck outside their house every few months for one reason or another and nobody comes out. Put smoke into the ground and they will stand in the rain and give you the drainage history of the block.

. . .

RACES.

A thing that comes up about once every couple of years and that I have never got tired of.

When a road is closed for something with cars going quickly on it, the covers get secured. Welded, in some cases. Bolted or strapped in others.

The reason is lift. A vehicle passing over a cover at speed pulls air out from under it, and a cover that weighs sixty kilograms and sits in a frame by gravity can come out of the frame, and once it is out of the frame it is a sixty-kilogram object on a course with cars on it and an open hole where it used to be.

This has happened, elsewhere, more than once, and it has ended sessions and it has ended cars.

So before an event somebody goes round and does every cover on the circuit, and there is an arrangement about who welds, who inspects, who cuts them free, and who pays if a frame is damaged.

The part I like is what it does to the schedule. Once they are welded, that section is not accessible until they are cut, and if something happens in there in the meantime the response is not the normal response.

So there is a document. It is short, it says which chambers and which dates and who to phone, and it exists because of a night in another city that nobody here was involved in.

. . .

THREE OWNERS.

The report goes in and the roof drain goes on a list.

The blockage two streets over does not go on a list, because the blockage two streets over has been on a list since March.

Here is the pipe. From the house to the property line it is private. The homeowner owns it. From the property line to the main it is the municipality's. From the municipal main to the trunk is the municipality's as well, and the trunk is ours.

One continuous pipe. Three owners.

The blockage is at the property line. Not near it. At it. It has been located twice, by two different cameras, run from two directions, by two organizations, and the two locates are one point four metres apart.

Nobody is being obstructive. The municipality will not open a road to fix somebody's private lateral, which is correct policy and is what I would say in their position. The homeowner's plumber will not dig into the road allowance without a permit, which he cannot get, because it is not his to get. Our involvement is that it is our trunk that is getting the consequences and we are the ones who noticed.

There is a mechanism. There is always a mechanism. It involves the municipality, the property owner, a shared-cost arrangement, and eleven weeks.

It has been about twenty weeks.

I do not know how it ends because I will have moved on to something else by then, and somebody will fix it, and the pipe will not care whose it was.

. . .

THE PLANS.

Two records of that connection exist.

The municipal record shows the lateral joining the main at a manhole. The as-built from the subdivision, which is 1974 and is a drawing rather than a database, shows it joining twenty-two metres downstream of the manhole, into the barrel.

Both are correct. I have seen the camera runs from both directions and the pipe does both things, and I have not got an explanation for that and neither has the municipality, and their surveyor and ours had a conversation about it that I was not in and that I am told was cheerful.

It is on a ticket. The ticket is closed. The disposition is *duplicate* — see *municipal record*.

. . .

THE HAND AND THE WET WELL.

The other one that week is a wet well at a pump station, which is a different kind of hole.

A wet well is where the sewage sits before the pumps lift it. It is a concrete chamber, it is deep, and the atmosphere in it is the reason the confined space regulation exists. Hydrogen sulfide comes off the surface, worse when the surface is disturbed. At low concentration it smells appalling. At high concentration it does not smell at all. It takes your sense of smell out first.

Everybody who does this work knows that sentence. Everybody says it to apprentices. It is the single most important fact in the trade and it is about a thing you cannot detect. That is why the monitor is the monitor. Nobody enters on their nose.

There is a pump down and there is rag on the impeller and there is a guide rail that has bent.

We are two hours setting up for forty minutes of work. Isolation, lock-out, tags on the starters with names on them, the level pulled down, ventilation running, atmosphere tested and tested again, harness, tripod, winch, attendant with the log.

The attendant is a woman from the collection crew who has the ticket and does not usually do this, and while we are rigging the tripod she says the standby list is short.

“Who’s normally on it?”

She says the name.

“Where is she?”

“Standby’s out. Has been since May.”

Which is correct. Standby was one of the things withdrawn, along with overtime and acting, and a standby attendant is a person on standby, and the job action does what the job action is designed to do, which is that the work gets harder to arrange.

She is good at it. She reads the procedure out rather than from memory, which the better attendants do, and she puts the log on the tailgate where she can write on it without turning away from the hole.

He goes down first because he is doing the impeller.

I am on the tripod for the first stretch. What I watch for twenty minutes is a man forty centimetres above what is in that well, on a platform, arms in past the elbow, finding a keyway by feel. He cannot see anything at all.

He finds it in three or four minutes. That is not the part.

There is a thing that happens to your face when you come up out of a wet well. Everybody has it. You get to the top and you put your head back and take about three breaths that are deeper than you meant them to be.

He comes up the ladder talking about the guide rail — whether it bent or whether it was never true — and wanting the crew lead to look at the bracket, and he is annoyed about the bracket in a way that is completely proportionate and entirely about the bracket.

The bracket was never true.

. . .

BILL.

There is a man on the crew who is retiring in the spring.

It is the end of the smoke day and there is tea and the tailgate is down and the Hand is leaning on it.

Bill was on the interceptor work in the nineties. He is precise about which part, because everybody says *the interceptor* and means half a dozen separate projects across eleven years. He was on the tie-ins.

A tie-in is the moment a new pipe is connected to a pipe that is already running. That is the difficulty of this industry in one operation. The old pipe cannot be turned off, because the region does not stop producing what it produces for the length of a shift. So you build the new thing alongside, and then there is one night when you cut into the live one and connect them, and either it goes or you are standing in a hole at three in the morning with a problem and a rising level behind you.

His was in January. Over-pumping arrangement, two lines, a bypass running while the connection was made.

At about half past two one of the two pumps started cavitating, which means it was not getting what it needed on the suction side and was about to be no use to anybody. The engineer was on site and was on the phone to somebody else.

Bill had about ninety seconds and he made a call about the running line and the sequence, and it was his to make, because there was nobody else standing at that valve.

It worked. That is what a good night looks like: the connection was made, the level behind it did what it was supposed to do, and by six the bypass was off and the road was open.

“Who knew?”

“Us four and the engineer.”

“What did the engineer say?”

“He said good.”

The engineer retired in 2008. Two of the four are dead. The crew lead is dead. What exists is a drawing showing a connection

between two pipes, and the connection is correct, and nothing about the drawing says anything happened at half past two.

The Hand listens to it, leaning on the tailgate, holding a cup, and does not say the things people say — no *that's a hell of a night*, no *you should have got something for that*.

He asks what the pumps were.

Bill tells him. Make and size and the arrangement.

"Both on the same suction?"

"Same header."

"Mm."

Bill puts his cup in the truck and gets his door.

He has told me two stories in eleven months. He has told the Hand eleven.

Bill is out in the spring.

. . .

Half four, back at the yard, kit off, and the report for the smoke test is nine findings including one roof drain, which is a good day.

The wipes go to landfill.

That is worth saying plainly, because the second question everybody asks after *what's the worst thing you've found* is *where does it all go*, and the answer for the wipes and the rag and the grit is that somebody screens it out at the far end, and washes it, and compacts it, and puts it in a truck, and it goes to a landfill.

You bought a wipe. You flushed it. It travelled several kilometres in a pipe at some expense. A machine removed it from the water. Another machine washed it. A truck drove it to a hole in the ground.

I explained that to the woman with the floor drain while she was filling her jug, because she asked, and she stood there holding the jug and said, "So it would have been faster to put it in the bin."

Yes.

"Why does it say flushable?"

Because it flushes.

. . .

THE RAIN.

Two weeks later there is an atmospheric river and I am on nights.

Nothing that happens that night is dramatic. Flows come up hard through the evening, which is expected and modelled and planned for, and the system does what it is built to do, which is to carry a multiple of its dry-weather flow for a period and then come back down.

What I do is drive to five locations and look at gauges and report numbers on the radio. That is the job on a wet night. You are eyes on the ground because a monitor tells you a level and a person tells you what the level means, and a person can also tell you that a lid is lifting, which no monitor will.

At one of the five there is a lid lifting.

That is a real thing to see. A cast iron cover weighing what it weighs, on a manhole in a residential street, moving on its seat, twice a minute, with the sound that goes with that.

I report it. Traffic control comes and cones it and it stays coned for two days.

At four in the morning I am parked with the engine off in a street where every house is dark and there is water going past under the road at a rate that would take a person off their feet, and I know that because I can hear it through a closed window and a metre of ground.

By seven the flows are back inside the band and I go home.

Nothing in between

Everything I do comes out of one document and the document is called Sewer Use Bylaw No. 299.

It was made in 2007 and it has been amended a number of times and it will be amended again. What it does is set out what may go into a sewer in this region, at what concentration, from whom, and on what terms.

There is a schedule of prohibited waste, which is the list of substances that may not be discharged at all under any circumstances by anybody; and a schedule of restricted waste, which is the longer and more consequential list of substances that may be discharged up to a stated concentration and not beyond it. There is a permit regime that applies to anybody discharging above certain thresholds or operating in certain named sectors, and the permit is an individual instrument with individual conditions on it. And there are codes of practice, which exist so that an entire category of small business can comply by following a published recipe rather than by holding and administering a permit of its own, which most of them could not do and none of them should have to.

The office at the top of it is the Sewage Control Manager. That is a statutory position rather than a job title — the bylaw names it and confers the powers on it. Permits are issued under that office. Trucked liquid waste authorizations are issued under that office. Discharge Abatement Orders are made under that office.

I am an inspector. I am not that office. What I do is go and look.

. . .

THE INTERCEPTOR.

There are something like fourteen thousand food service establishments in this region and every one of them makes grease.

Grease in a sewer is the substrate for everything else. It is what turns a wipe into a rope. A regional trunk with a grease problem is a regional trunk that will have a blockage problem, and a blockage in a trunk is not a small event.

So there is a bylaw for it — a separate one, the food sector one — and it requires an interceptor, sized to the kitchen, maintained on a schedule, with the maintenance recorded.

The interceptor is a box. Wastewater goes in, the grease floats, the solids sink, and what leaves the middle is cleaner than what came in. It works entirely because of density and it has no moving parts and it is the most elegant object in my working life.

It works if you clean it. It stops working if you do not, and when it stops working it does not stop obviously.

. . .

The restaurant is in a strip on a busy road and it has been there nine years.

The interceptor is under the floor at the back and the lid has been sealed with a mat and a stack of empty oil drums, which is not defiance, it is a small space and a busy kitchen and the drums have to be somewhere.

The maintenance log has entries through to about fourteen months ago and then it stops.

“Who does the pumping?”

“The guy.”

“Do you have a name for the guy?”

“He comes.”

“When did he last come?”

He does not know. He is not being evasive and he is not lying to me. He genuinely does not know, because his brother-in-law arranged it, and the brother-in-law is not involved in the business any more, and the arrangement went with him and nobody noticed because nothing happened for a year.

He is a decent man having a bad quarter. He tells me, without my asking, that the landlord has raised the rent, that his fryer failed in April, and that his daughter is in her second year at university. None of that is a defence and he does not offer it as one.

What I give him is a compliance date and a list of licensed haulers, and the information that the maintenance record is a requirement in itself — that the pumping is not enough, that the paper is part of the duty.

He asks me whether he is in trouble.

I say not yet.

He says, “What happens if I am?”

. . .

WHAT HAPPENS IF HE IS.

That is the question this organization’s enforcement structure sits on, and the honest answer is that almost nothing happens for a long time and then something enormous happens.

At the bottom there is a conversation. Then a letter. Then a formal notice with a date on it. Then a Discharge Abatement Order, which is an order, and which is real, and which has consequences for a permit.

And at the top there is prosecution in the Supreme Court of British Columbia.

Between the order and the court there is nothing.

There is no ticket. There is no administrative penalty. There is no fine that an inspector can write on a pad and hand across a counter, of the kind that a parking officer has, or a health inspector, or a conservation officer, or half the people this man deals with in a year.

This organization has asked the Province for that authority. It has asked repeatedly and it has been asking for a very long time — long enough that people in this section can date the asks the way people elsewhere date reorganizations. The file exists. It goes forward, it does not come back, and it goes forward again.

So what I have, for a man with a sealed interceptor and a rent increase, is a conversation, a letter, and a courthouse. The distance

between the second and the third of those is the distance between an inconvenience and a business ending.

Which means the instrument almost everybody actually gets is the conversation, and the reason compliance works at all in this region is that most people, given a date and a list and a plain explanation, do the thing.

That is not a system. It is a set of relationships doing the work of a system, held up by inspectors being reasonable and business owners being decent, and it has held for a long time, and everybody in my section knows exactly how it would fail.

. . .

GORDON.

There are six of us in the section and one of them is not good at it.

He is not lazy and he is not careless. His files are complete, his sampling is correct, his reports are on time and are better written than mine. On paper he is the strongest inspector in the section.

He cannot do the conversation.

Every visit he makes becomes adversarial inside four minutes, and he does not know why, and it is not because he is rude. It is that he leads with the section number. He walks in, identifies the breach, cites the provision, and states the requirement, and every one of those is correct and in order, and by the time he has finished the person in front of him has decided that this is being done to them.

Then they stop volunteering things. And once they stop volunteering things you are working from what you can see, and what you can see is about a third of what is going on in a building.

I have watched him take four visits to establish something I would get in one, and the four visits were each more rigorous than my one.

The sector he has is the one with the most repeat non-compliance in the region and has been for six years, and everybody knows the number and nobody has ever said the two things in the same sentence in a meeting.

He knows. That is what makes it worse. He asked me, once, in a truck, what I say when I go in, and I told him, and it was not useful,

because what I say is not a script and I could not give him one. He wrote some of it down. He has tried it and it does not work when he does it, and I have watched that too.

The system I described above — the one held up by conversation, because there is nothing between a letter and the Supreme Court — does not work for Gordon. It works for the other five of us and he is inside the same structure with the same powers and the same bylaw and it does not work.

I do not have a solution and neither does he and neither does anybody above us, and he will do this until he retires, which is nine years.

. . .

THE LIST.

The thing I did not expect about this job is how much of it is knowing who is good.

I carry, in my head and nowhere else, a list of about a dozen haulers, four plumbing outfits, two people who install and commission pH systems, and one man who will come out on a Saturday to a small business that has made an expensive mistake.

None of that is anywhere. It is not on the website. It cannot be on the website — this organization cannot publish a list of preferred contractors, for reasons that are entirely correct and that I would defend.

So it lives in inspectors, and it goes when they go, and a new inspector spends two years rebuilding it from scratch by watching which jobs get done properly.

I mentioned this at a section meeting once as a succession issue. Everybody agreed. Nothing has happened, and nothing is going to happen, because the only way to write it down is to write it down, and writing it down is the thing that is not permitted.

. . .

THE BREWERY.

Fermentation is its own bylaw, which surprises people, and which stops surprising them a minute or two into the explanation.

Brewing produces a wastewater that is high in organic strength and variable in pH and arrives in slugs rather than steadily. A cleaning cycle can put a caustic slug into a sewer in ten minutes. Spent yeast is extraordinarily strong. None of that is toxic and none of it is sinister and all of it is a problem at the far end, because a treatment plant is a biological process and biological processes do not enjoy surprises.

There are a lot of breweries in this region now. There were not, twenty years ago.

The two men who own this one are in their thirties and they have built the place themselves and they are extremely good at making beer.

“There’s a bylaw for breweries.”

“For breweries specifically?”

“For fermentation operations.”

They look at each other. One of them says, “Is there a bylaw for everything?”

There is a bylaw for hospitals. There is one for trucked liquid waste. There is a code of practice for vehicle washing and one for photographic operations, which is a code of practice with almost nobody left under it.

They are not annoyed. They are appalled at themselves, which is a different thing, and the appalled ones are the easiest visits I do. They ask what they should have done, and I tell them, and one of them starts writing on his phone.

What they need is a balance tank and a pH adjustment on the discharge and a monitoring arrangement, and that is money, and I say so plainly, because a man who finds out the number from me on a Tuesday is in a better position than a man who finds it out from an order in November.

They ask if anybody else has done it. I say most of them.

The one writing on his phone says, “Who’s the best one to talk to?”

That is the correct question and almost nobody asks it. I give him three names.

. . .

CODES OF PRACTICE.

The instrument that does most of the actual work in this region is not the permit. It is the code of practice, and almost nobody outside the section has heard of one.

A permit is individual. Somebody writes it, somebody negotiates it, somebody administers it, and there is a file for every one. That is affordable for a plating shop with a real discharge and it is not affordable for four thousand restaurants and a few hundred small operations that all do approximately the same thing.

So a code of practice sets out the requirement once, for a category. Register, do the things in the document, keep the records, and you are compliant. No negotiation, no individual file, no annual back and forth.

It is the reason this section can function with the number of people it has.

The trade-off is that a code has to be written for the median operator, and the median operator in a category is not the one causing the problem. A code cannot be tightened for the worst premises in a sector without tightening it for everybody, which means you either accept the tail or you impose cost across a whole category to reach four businesses.

That argument runs on about a four-year cycle in every sector I have and it has never once been resolved in the direction of individual permits, and I think that is right, and the four businesses are still there.

. . .

THE HOSPITAL.

There is a bylaw for hospitals and there is a good reason for it.

A hospital discharges things a sewer was not designed for and that a treatment plant cannot do much about: pharmaceutical residues, disinfectants, imaging agents, and the general chemical output of a building where an enormous amount of medicine happens. The bylaw is about pollution prevention — plans, best practices, source-side control — rather than about limits at the pipe, because a limit at the pipe on a hospital is not a useful instrument.

The visit is with a facilities engineer who is competent, cooperative, and stretched across four sites.

“When was the plan last updated?”

“2019.”

“It’s a three-year cycle.”

“I know it’s a three-year cycle.”

“Right.”

“I’ve had a boiler replacement, a seismic assessment, two accreditation cycles and a roof.”

“I know.”

“The plan is on my list.”

“Where on your list?”

And he laughs, because there is no answer to that, and then he says something I have thought about since, which is that a hospital has about forty compliance regimes running through it at any time and that the only ones that get done on time are the ones with an inspection date attached, and that mine has never had an inspection date attached, and that if I want it done I should start turning up on a schedule.

He was telling me how to make him comply. I wrote it down and it changed how I run that sector.

. . .

THE OFFICE.

The Conscience-Keeper is the Sewage Control Manager, which means that everything above — the permits, the authorizations, the orders — is signed at his desk.

The desk is not impressive. He shares a floor with the trucked waste administration and there is a whiteboard behind him with somebody else's cycle route planning on it that has been there since before I started.

He is in this account from the beginning because he is in the work from the beginning. Every file I open exists because of a document he signed, and every file I close goes back for him to close.

What I brought him was the restaurant, on the Thursday, in the corridor, before I had opened anything.

I got as far as saying which strip it was on and he said *not the record*.

That is all he said. I was going to raise the maintenance record — the log that stops fourteen months back — and he removed it before I had named it, and he did not tell me what to raise instead.

What is left when you take the record away is the duty the record is evidence of, which is the obligation to keep the thing in effective operating condition, and which is the thing. I got there on my own in the car.

It mattered five weeks later, when the hauler's paperwork arrived and did not match and the file was already framed the right way round.

The file note that says so is under a colleague's name. She wrote it, and she wrote it well, and it is her note. A file note is about the file.

. . .

THE HAULER.

The one time I have watched him use it was not my file and I was in the room because I had brought a different file and had not left.

Trucked liquid waste. Anybody hauling septic or holding tank or non-domestic load to a receiving station needs an authorization, and

the authorization is issued out of that office, and it is the thing that makes a hauler a business rather than a man with a truck.

This one had been in trouble for eleven months. Manifests that did not reconcile. Two loads received that did not match what the manifest said they were. A source declaration that named a premises which, when somebody went and looked, was a house.

There had been a conversation. There had been a letter. There had been a second letter with a date on it and the date had gone.

He came in with his son, who was about twenty and who did the driving, and who sat down and then stood up again and then sat down.

“You know why you’re here.”

“I know why I’m here.”

“Tell me about the twelfth.”

And the man told him about the twelfth, and it took four minutes, and about two minutes of it was true and both of them knew which two.

He did not interrupt. He did not say *that’s not what the manifest says*, which is what I would have said, and which would have turned it into an argument about a document.

When it was finished he said no. Then he said it again with the number of days on it — ninety — and then the conditions on reinstatement, and none of it was framed as a penalty and all of it was framed as a stop.

The man said it would finish him.

He said it might.

Then he said the conditions — a written procedure, two months of manifests reviewed before submission, and a meeting at sixty days — and he said them slowly enough for the son to write them down, and the son wrote them down.

Nobody raised their voice at any point. The man was in that office for eleven minutes.

Afterwards he signed it and it went to the file and he asked me what I had brought.

The authorization came back at ninety-four days. I checked, about a year later, for no reason connected to anything.

. . .

THE CHAIR.

There is a chair beside that desk that is not for visitors and is always occupied.

I have been in it. What you go in with is a file. What happens is that you finish the file business in about ninety seconds and then you are still sitting there.

The last time, I told him about a plating shop I had spent five months on in my second year, which came out well, and which came out well because of a decision I made about how to approach the owner and not because of anything in the bylaw. Nobody above my supervisor ever knew there had been a decision. My supervisor has retired.

He asked what the finish was. I said nickel. He said nickel, in the way you say a word back, and then somebody came in with a permit and I got up.

I have thought about why I did that at all. The file did not need it. He could not have done anything with it. I have not got to the bottom of it and I have gone back.

. . .

I sent the restaurant his compliance date and his hauler list on the Friday and he had it pumped on the Tuesday.

The log is current now. It will probably stay current for two years and then a brother-in-law equivalent will happen again, somewhere, to somebody, and that is not cynicism, it is the actual shape of the work.

The bylaw sits behind all of it doing very little visibly. There is a set of powers in that document that have almost never been used in the region's history and that are the reason a phone call from me is a phone call that gets returned.

I have never issued an order. Most inspectors never do.

. . .

The other thing the bylaw has is a reputation, and the reputation is not accurate and I have stopped correcting it.

There is a belief in parts of the small business community of this region that we can shut you down. We cannot. There is no provision anywhere in that document that permits an inspector to close a premises. What we can do is stop you discharging, which for a restaurant amounts to the same thing on a Friday night, and the distinction between those two facts has never once helped me in a conversation.

The brewery pair phoned me in October, seven months after the visit, to say the balance tank was in and commissioned.

“You don’t have to phone me about that.”

“We wanted to.”

“There’s a form.”

“We did the form.”

“Then you’re done.”

A pause on the line. Then: “So we’re allowed to be a brewery?”

“You were always allowed to be a brewery.”

“That’s not how it felt in March.”

He is right and I have thought about that since, and the honest position is that a man in a high-visibility vest with a bylaw in his hand and an entirely reasonable manner is still a man who has arrived at your business about something you did not know existed.

They sent a case to the office. I could not accept it, which I explained, and they were fine about it, and it went to a food bank, which was also fine, and there is a note about it on the file because there is a note about everything.

Upstream

ONE.

The plant calls it in on a Tuesday.

Something is arriving at the works that should not be. It is not a spill and it is not an emergency and nothing is failing. It is a signature in the composite sample, at a level that is not dangerous and is well outside what that part of the system ought to be producing.

It has almost certainly been arriving for years.

People find that strange, so plainly: the plant added the parameter to its routine suite in March. Before March nobody was looking for it. It is not a new discharge, it is a new measurement, and the reason it appears in the record on a Tuesday in June is that somebody bought an instrument.

Which means the phrase everybody uses — *a new anomaly* — is wrong in both words, and I have stopped correcting it because the file needs a heading.

The plant's interest is that it is a load on a biological process. My interest is that somebody upstream is putting it in a sewer.

We start where they found it, which is the bottom, and we work up. That is the only direction available. Everything in that pipe came from somewhere higher than the pipe.

The area draining to that point is about a hundred and forty thousand people and roughly nine hundred non-domestic dischargers of a size we know about.

The call is from a process control chemist at the plant and it lasts nine minutes.

"It's not a hazard."

"I understand."

"I want to be clear about that before you go out and frighten somebody. It is not a hazard, it is not going to hurt anybody, and if it

stopped tomorrow the only thing that would happen is my numbers would get tidier.”

“Understood.”

“But it’s there every day at the same time of day, and I’ve now got three months of it, and I’d like to know what it is.”

“Same time of day is useful.”

“That’s why I phoned.”

A signature that arrives at a consistent hour is attached to somebody’s working day, and a working day is a business rather than a house.

That does not narrow it as much as you would hope. It narrows it to about nine hundred premises.

. . .

Two.

Manholes.

There is a truck and there is a lid hook and there is a gas monitor on a strap and there is traffic control if the lid is in a road, which most lids are.

Lift the lid. Check the atmosphere. Sampler down on a rope. Draw what is coming past. Label it. Log the location and the time. Lid back. Drive to the next one.

We do eleven that day and nineteen the next.

There is a lid on Kingsway that takes two of us and the bar and four minutes, because it has been repaved around three times and the last contractor to touch it filled the pick holes with asphalt. Mireille takes a photograph of it and sends it to somebody. She has, I later find out, a list.

There is a lid in a lane behind a row of shops that is under a dumpster. The dumpster has to be moved and the person who can move it is at lunch. We do three others and come back.

There is a lid in a parking area belonging to a business that comes out to ask what we are doing, and I explain, and he asks whether he is in trouble, and I say no, and he asks again in a different way a few minutes later, and I say no again.

That happens perhaps once a day. It is worth understanding about this work: a marked truck and two people in high-visibility standing over an open sewer will produce, in any commercial area, at least one person who believes it is about them. Most of the time it is not. Once, in my time, it was, and the man who came out to ask had been putting something down a floor drain for two years and told us about it inside ninety seconds, standing in his own doorway, unprompted, before anybody had asked him anything at all.

That is not a technique and I would not build a programme around it.

The method is a bisection. Find a junction where two branches meet. Sample above both. Sample below both. One branch has it. The other does not. You have halved the problem. Then do it again.

That is it. That is the technique. It is a hundred and fifty years old and it works and there is nothing more sophisticated available at this scale, and there is a version of this job that a person could do with a bucket and a nose and enough patience.

THREE.

The inspector I am out with is called Mireille and she has been doing this for nine years.

She does not explain anything and she does not narrate. She has a notebook that is a grid and the grid has no words in it. She lifts, tests, samples, labels, logs, replaces, moves. At a pace I could not sustain. Eleven while I do seven.

I asked her once, early, how she picks which junction to do first, and she said you look at the pipe. I asked what she looks for and she thought about it and said you look at the pipe.

I have watched her be wrong twice in three years and both times she said so within a minute.

The only sustained thing she has ever said to me about the method was in a truck in the rain waiting for a dumpster to be moved, and it was about pipe age.

“Sixties concrete.”

“Is that bad?”

“It’s not bad. It moves. Joints open.”

“So more infiltration.”

“So the dilution’s different on that branch than the branch beside it, and if you don’t know that, you’ll read the numbers wrong and you’ll go the wrong way and you’ll lose a week.”

That is the most I have got out of her in three years and it is a complete education if you sit with it, and she said it while looking at a dumpster.

. . .

FOUR.

On the fourth day it goes wrong.

The north branch reads positive — clearly positive, twice, on consecutive days — and it should not, because the north branch serves a residential area with two small commercial premises on it, neither of which does anything relevant.

We spend a day and a half on it. Mireille samples upstream of the two premises. Both clean. She samples the branch again. Positive. Above the junction, clean. Below it, positive. That puts it in about ninety metres of pipe with nothing on it but houses.

That was the point at which I thought we had something interesting.

What we had was a bottle. One of the sample containers in that day’s batch had not been acid-washed properly, and the parameter is one that is sensitive to it, and the two positives were the same bottle type from the same batch used on the same branch on two days because we were rotating through them in a fixed order.

We found it because the laboratory queried the pattern before we did.

That is a day and a half and about thirty samples. It cost more than any other part of the trace and it produced nothing except a change to how the crates are made up.

I put it here because a trace that runs eight days and works every time is not a trace anybody has been on. Every one I have done has had a day like that in it, and most of them have had two, and the reason the arithmetic on this work looks the way it does further down is that the failures are in the number.

. . .

By the Friday the trace is down to four blocks.

It has taken eight days and about a hundred samples and two people, and it has narrowed from a hundred and forty thousand people to four blocks, which is a light industrial pocket with about thirty premises on it and a laboratory supply business and a place that does architectural metal.

This is where a trace usually ends. Four blocks. Thirty doors. The last split is the hard one. Short branches, high dilution, and a signal that was clear at the trunk is faint here.

Mireille wants three more samples on the east branch.

The Seeker is there because he has been there since the second day, in a second truck, doing the same work in the same way, and he has not said anything that I would call a contribution.

He says he will do the west branch tomorrow.

There is no reason for the west branch. It has been sampled and was clean, twice, at the point where it joins. Mireille says as much, without heat, in the way you say a fact to somebody who has the same facts.

What he says back is a drawing reference. The 1974 subdivision as-built, held by the municipality, superseded in the sanitary layer and not in the storm layer, and he says which of the two the west branch sits in on that sheet and who has the current version and that the current version is not the one we are working from.

He does not say the branch has it. He says which record would know.

FIVE.

The west branch has it.

It has it at the third manhole up, faintly, and then at the fourth it is unmistakable. On the sheet we were working from the fourth manhole serves four premises. On the one he named it serves six. Two of the six are the two that were not on ours, and one of those two is a business that recovers metals from small equipment.

They are not hiding anything, and that is true of almost all of them.

The owner takes us into the back and shows us the process without being asked twice. It is a rinse stage. It has been running exactly as it runs now since 2011. He has a permit — he has had one throughout — and the permit covers a discharge from a process he described accurately when he applied for it in 2009.

The process he described is not the process he is running. In 2016 a supplier talked him into a different chemistry on the grounds that the old one was more hazardous, which it was.

The new one is safer to have in a building and safer for the four people who work with it. At a treatment plant, nine years later, it is a different problem.

He did not tell anybody, because he did not know there was anybody to tell. He changed to a safer product. In his understanding of the world that is the end of the sentence, and I would like to be able to say it is not, and it very nearly is.

He asks if he is going to be shut down.

“No.”

“Because I’ve got four people.”

“You’re not going to be shut down.”

“I changed it because the supplier said the old one was worse. I’ve got the email.”

“I believe you.”

“Do you want the email?”

He wants me to want the email. He goes and gets it while we are standing there and it is from 2016 and it says exactly what he said it says, and it is the correspondence of a man being talked into doing something better by somebody who sells chemicals, which is a completely ordinary thing to happen and which is why he is now in a file.

What I do not say to him, because it is not the moment and because it would sound like a reproach, is that the permit has a clause requiring notification of a process change, and that the clause is not obscure, and that he signed it.

I say it in the letter. In the letter it is a sentence with a section number in it and it reads as neutral, which it is.

He asks how long it will take.

I say months, and he says that is what he thought, and offers us coffee, and we say no, and he says, "It's no trouble," and we say no again, and he stands in the doorway while we get in the truck.

THE OTHER SIX.

The manhole that found it served six premises and I went to all of them, because that is the procedure and because the sampling narrows to a manhole and not to a door.

A cabinet shop. A place that reconditions industrial sewing machines, which employs four people and which I would happily have spent the afternoon in. A courier depot. A unit that was empty and had been for a year and had a working water service and a floor drain, which I noted, because an empty unit with a floor drain is a thing worth knowing about. A martial arts school with a shower block.

And the metals recovery.

Five of the six took about twenty minutes each. Nobody was difficult. The courier depot manager wanted to know whether this was about the parking, which it was not, and was visibly relieved, and I did not ask about the parking.

The reason I mention them is that this is the actual ratio of the work. One finding, six visits, and the five were not wasted, because five premises in that block now know that somebody comes.

. . .

SIX.

The file opens on the Monday.

What it will contain is a permit amendment application, a monitoring requirement, and probably a treatment step at his cost, and it will take months and it will be tedious and it will be resolved, and he will be irritated and compliant in about equal measure.

That is not this account.

Mireille writes the trace up on the Friday afternoon in the truck with the engine running because the heater is the only thing keep-

ing the paper dry. Location, date, time, result, for a hundred-odd samples, and a summary that is four sentences long.

The summary says the source was identified on the west branch following sampling on the eighth day.

It does not say who sampled the west branch, because the summary does not have a field for that, and because the sampling data supported the west branch as one of three remaining candidates, which it did.

I read that summary before it went and I did not raise it, and I have not raised it since.

THE EIGHT DAYS.

Somebody asked me, at the end of it, what a trace costs.

Two inspectors, eight working days, a truck each, about a hundred and forty samples, and the laboratory time on those samples, which is the largest single line and which nobody outside thinks about. Traffic control on four of the days. A hundred-odd manhole entries with the atmosphere tested on every one.

Against: a discharge that was not hazardous, from a business acting in good faith, that will be resolved by a permit amendment and a treatment step at the discharger's cost.

The arithmetic on that single event does not work and I would not pretend otherwise in a meeting.

What the arithmetic is actually about is that the traces happen. That there is a section that will go and find out, over eight days if it takes eight days, and that this is known in the sector, and that the knowing is the thing that is being bought. Nine hundred non-domestic dischargers in that sewershed behave the way they behave partly because a person might turn up with a lid hook.

I cannot demonstrate that. Nobody can. It is the standard problem of every preventive programme ever funded, and every three or four years somebody senior asks for the number, and the number does not exist, and the programme survives on the strength of people who have been here long enough to have seen what happens without it.

THE LETTER.

I drafted it on the Tuesday and it went out on the Thursday under a signature that was not mine.

Four paragraphs. What was found and where. What the permit says about notification of process change, with the clause number. What is required now, which is an amendment application and interim monitoring. And a date.

It does not say he did anything wrong, because a letter that says a man did something wrong invites a letter back saying he did not, and then you have two letters and no amendment application.

He phoned me on the Friday to ask whether the date was firm and I said it was, and he said all right, and then he asked whether the supplier should have told him.

That is the question underneath all of it and it is not one I can answer in a way that helps him. There is no obligation on a chemical supplier to know what a customer's discharge permit says. There is an obligation on the permit holder, and the permit holder is a man with four staff who reads what arrives and did what he was advised.

I said the obligation was his.

He said, "Yeah," in the way people do when they already knew and were hoping.

. . .

She drops me at the yard at twenty past four and says the thing she says at the end of every day out, which is, "Right."

PART FIVE

THE PLANT

Headworks

This procedure applies to the changeover of a mechanical bar screen. Read it at the screen. Do not read it at the desk and go down.

Headworks is the front of the plant. Everything arrives here first and nothing leaves it in the state it arrived in.

What arrives is what the collection system delivers, at the rate it delivers it. Not a rate anybody here sets. There is no valve upstream of this building. There is no arrangement under which the plant declines a flow. There is no procedure for it. In fifty years nobody has written one. It is not a thing that can be done.

So the first job of the works is to take out everything that is not water and is not going to be treatable. Then put it in a skip.

1. CONFIRM THE SCREEN IS ISOLATED AND LOCKED OUT. CONFIRM THE TAG CARRIES YOUR NAME.

There are coarse screens and there are fine screens and they do the same thing at two scales.

A bar screen is a set of vertical bars across the channel with a gap between them, and a rake that travels up the face of it and lifts what has collected. The gap is the design decision. A wide gap passes more, blocks less, and sends more downstream. A narrow gap catches more, blinds faster, needs a bigger rake, and takes more of your day.

What collects on it is called screenings, and screenings is the industry's word for everything that came down a sewer and is not sewage.

Rag, which is the trade word and which now means wipes.

Plastic in every form.

Textile.

Sanitary product.

Hair, which arrives as mats.

And grease, which is not caught by the screen and which coats it.

WHAT ARRIVES WITH IT.

Grit comes in with weather and rag comes in all the time, and then there is the third category, which does not have a name and which everybody calls the objects.

I am not going to list them, partly because there is a version of this trade that consists of telling those stories at parties and I do not do it, and partly because the list is not interesting once you have been here a year. What is interesting is the pattern.

Objects arrive in seasons. There is a rhythm to what comes down a sewer and it maps onto the calendar with an accuracy that would surprise anybody who has not watched it. Certain things arrive after certain weekends. Certain things arrive in the first week of September. The one everybody notices is the spring, when the ground dries and people clear out.

And there is a rhythm to volume, which is not seasonal but daily. Flow arrives at this plant in a shape, and the shape has two humps in it — one in the morning and one in the evening — offset from the domestic pattern by the travel time in the collection system, which is hours and varies with distance. The shape is the same on a Tuesday as it was on a Tuesday in 1998. It changes on a Sunday. It changed for about two years and then changed back.

Operations plans against that shape. It is one of the most reliable curves anybody in this building has and nobody outside the industry knows it exists.

. . .

2. CONFIRM THE STANDBY SCREEN IS IN SERVICE AND PASSING FLOW BEFORE YOU TAKE YOURS OUT.

That is the sentence that matters and it is why this procedure exists. The channel does not stop. Take a screen out without the standby carrying and you have a rising level, no bypass, and something under five minutes to think about it.

I have never seen it happen. I have heard it described twice by people who saw it, and both of them described the same thing, which is the sound.

. . .

THE OTHER HEADWORKS.

There are two lines through this building and they are not the same age.

One of them is original with equipment that has been replaced twice inside the original structure. The other went in during the last major expansion and has finer screening, better extraction, a washer-compactor of a different make and a control philosophy that assumes somebody is looking at a screen rather than standing next to it.

Operators have a preference and it is not the new one.

Nostalgia is not what that is. The new line is better at its job by every measurement that matters and takes more out of the water. What operators say about it is that when it is wrong you have to find out from a screen, and the old line tells you from across the channel — a change in note, a change in the rake's rhythm, the way the water sits in front of the bars.

The senior operator's version: "I can hear the old one from the door."

The engineer's version, which is also correct: "You shouldn't have to be at the door."

Both of those are true and the second one wins, because a plant staffed on the assumption that somebody is always at the door is a plant that has to be staffed at a level nobody funds any more.

. . .

3. RAKE THE FACE DOWN BEFORE YOU OPEN ANYTHING.

You do not open a blinded screen. A blinded screen has a head differential across it. More water on one side than the other. Break

it and the difference equalises through the opening you have just made, and takes what is on the face with it.

Rake it down. Then rake it again. Then look at it.

4. OPEN THE ENCLOSURE. EXPECT ODOUR. THE EXTRACTION IS RUNNING; IT IS NOT ENOUGH.

Every part of this building that is open to the water is under negative pressure and the air is drawn off and scrubbed, and that system works and is well maintained and is one of the reasons this plant sits where it sits without the neighbourhood being unlivable.

It is not enough at the moment you open a screen enclosure. Nothing would be.

. . .

THE CALL.

Odour complaints come through to the plant and on days there is a good chance I take them.

“Is this the treatment plant?”

“It is.”

“I’m on the road that runs along the back. Behind the fence.”

“I know the road.”

“It’s bad this morning.”

“Which way’s the wind?”

A pause, and then a door, and then: “Off the water.”

“That’s it, then. That’s the one that brings it to you.”

“So you know.”

“I know the wind. I don’t know what you’re getting.”

She is not a crank and she is not exaggerating and she is not going to be talked out of it, and I would not try. The odour control on this site is extensive and it is maintained and there are people whose job is nothing else, and on a particular wind, on a particular morning, at a particular temperature, a plume goes where the air takes it and there is a fence and then there is a road and then there are houses.

I take the address and the time and what she describes and it goes on the log, and the log is real and it is looked at, and it is one of the inputs into where the next tranche of capital goes.

“Does anything happen with this?”

“It goes on a record. The record’s used.”

“That’s not a yes.”

“It’s not a no either.”

She laughs, which I had not expected, and says she will phone again on Thursday if it is bad on Thursday, and I say she should.

. . . .

5. CLEAR THE RAKE PATH. SCREENINGS ARE REMOVED BY HAND.

By hand.

There is no machine for the last part of it. There is a machine for the ninety-eight per cent and the two per cent is a person with a scraper and a bag, working at arm’s length, for as long as it takes.

That is the job. That is the actual job at the front of this plant, and there is no version of the twenty-first century in which it is not, and I have read four articles about automation in this sector in the last two years and none of them mentioned it.

There is a new operator doing that part for the first time this month and it takes him about three times as long as it needs to.

That is normal. Everybody is slow the first time, because you are working out where to stand, and where to stand is most of it.

What is not normal, and what two of us noticed, is that he apologized eleven times in forty minutes.

“Sorry, I’m being slow.”

“You’re all right.”

“Sorry.”

“You’re all right.”

At about the eighth one the Hand, who was on the platform waiting to get at the teeth, said, “Don’t say sorry.”

Not unkindly. Not as a lesson. He said it the way you say a thing about the job, and then he said what he meant, which was that if

you are apologizing you are hurrying, and if you are hurrying in a channel you will put a hand somewhere.

The new man did not apologize again that morning. He is still slow and will be for a year.

. . .

6. INSPECT THE RAKE TEETH AND THE CHAIN. REPLACE WHAT IS DAMAGED.

Rag gets round everything that turns. It finds a shaft. It wraps. It builds. It goes on building until the load takes the drive out.

The Hand does the rake teeth. He is on mechanical and this is his and it is the least popular scheduled task in the building and he does it on the day it comes up.

He gets in the channel. He is in it to the top of his boots with a bar and a scraper and the enclosure open, doing a maintenance task that is entirely ordinary and that four people are standing above watching because it is a confined space and there is a permit and that is what the permit says.

He is not doing anything remarkable and nobody says he is.

What I would say, if somebody asked me, is that he is quick at it. That is all. He is quick, and he does not stop, and there is no point in the task at which he pauses.

WHAT IT DOES TO YOU.

Two hours in a screen enclosure on a warm day and you take it home.

Not on your clothes. There is a change facility and it is used and the coveralls do not leave the site. It is in your hair and it is on your skin and it is in the back of your nose, and the first year you shower twice and the third year you shower once and stop thinking about it.

The one thing that does not go away is that you cannot smell it after about twenty minutes on shift, and you cannot tell whether you smell of it, and there is no way to check. Everybody around you is in the same condition. So there is a period at the start of a career

where you are quietly anxious about that in shops, and then there is not.

I asked the senior operator, once, whether it bothered him.

“Bothered me for a year.”

“And then?”

“Then I got a mortgage.”

The pay is good and the pension is real and the work was secure in a way almost nothing else available to him in 1994 was.

. . .

WHAT PEOPLE DO ABOUT IT.

Everybody arrives with a theory and nobody keeps it.

Menthol rub under the nose is the commonest and every new operator tries it and every one stops inside a month, because it adds a smell rather than removing one, and the mint is the one you cannot get away from because it is attached to your face.

Mouth breathing works and costs you. You are then tasting it.

The senior operator’s method is that he does not have one.

“You just stop?”

“You stop noticing.”

“How long?”

“Two weeks.”

He says two weeks and he has said two weeks for as long as anybody has asked him, and the millwrights say a month and the man on the digester side says a season, and none of them agrees with any of the others, and all of them say it with total confidence.

They are partly lying, and I do not think they know it.

What is true is that your nose fatigues, and it fatigues fast — twenty minutes on shift and it is gone, and that is a real physiological thing and it happens to everybody. What is not true is that you stop smelling it. You smell it fresh every single morning when you come through the gate, on day one and on day four thousand, and then it goes.

So the honest answer to *how long* is *twenty minutes, forever*.

The reason they say two weeks is that two weeks is about how long it takes to stop being alarmed by the twenty minutes.

. . .

THE WASH.

The coveralls stay on site and are laundered on site and that is not negotiable and nobody wants it to be.

The argument is about everything else.

There is a dispute on this crew about detergent that is four years old and has had three phases. Hot wash and standard. Cold wash and enzyme, on the grounds that hot sets the protein. And a faction of one who puts vinegar in the rinse and will not be moved.

The vinegar man cannot win it because nobody can construct a controlled trial. Nobody is prepared to wear the control.

Undershirts are the real battleground, because coveralls come off and an undershirt has been under coveralls for ten hours in a warm building. Hair, nobody has an answer for.

. . .

OUTSIDE.

My partner has a rule about the car.

The rule is that I do not put the bag in the back seat, which is a rule I initially thought was unreasonable and now enforce more strictly than she does. There are three of us on this crew with a version of that rule and one whose garage is not a garage any more.

She has never once complained about me. She has complained about the bag, the boots, and on one occasion a jacket, and those are three specific objects and not a person, and I have come to appreciate the distinction because I have heard how other people's versions of that conversation go.

The thing she says, which she has said perhaps twice, is that she can tell what kind of day it was from the door. Not the smell.

Something else. She has never explained it and I have never pushed, because I suspect the answer is about my face and I do not want it.

. . .

HEPATITIS A, AND THE REST OF IT.

The immunization programme exists for a reason.

Hep A is the standard one and it is offered and it is taken. Tetanus is current or you do not work. There is a list of other things that get discussed on hiring, and there is a document, and the document is longer than a new operator expects.

Beyond that it is hygiene, which is deeply unglamorous and is the actual control. You do not eat in a process area. You do not touch your face. You wash before you do anything, including the thing you were about to do that would only take a second.

Endotoxin gets talked about more now than it did. Aerosolized material at the front of a works, over years, and a set of respiratory outcomes that are not dramatic and are real, and there is a fit-testing programme and there are people who wear a half-mask at the screens as a matter of course.

The senior operator does not. I do. Neither of us has ever said anything about the other one.

. . .

7. RETURN THE SCREEN TO SERVICE. CONFIRM THE RAKE TRAVELS. CONFIRM THE DISCHARGE IS TO THE WASHER-COMPACTOR.

. . .

WHAT HAPPENS TO IT.

Screenings go from the rake into a washer-compactor, which does what it says. It washes the organic material back into the flow, where it belongs. Organic material is what this plant is for. There is no

sense sending it to a landfill. Then it compacts what is left and squeezes the water out.

What comes out the far end is a compressed cylinder of what was on the screen, drier, smaller, and destined for a skip.

Grit is separate and is caught in a vortex chamber downstream, where the flow is made to spin and the heavy fraction drops out. Sand, road grit, glass, coffee grounds, and the general mineral content of a city.

Grit is the one that costs money quietly. Abrasive. Through pumps. Wearing them from the inside. A plant not getting its grit out is a plant with a rising maintenance line and nobody sure why.

Skips go to landfill. There is a truck, it comes on a schedule, and the number of tonnes a year is a number I know and that surprises everybody I say it to.

8. SIGN THE LOG. THE TASK IS NOT COMPLETE UNTIL IT IS SIGNED BY THE OPERATOR WHO DID IT.

. . .

THINGS THAT GET SAID.

Every trade has them and ours are worse than most.

When a bad one comes through the building — and there are bad ones, there are days when the extraction is doing everything it can and the wind is wrong and something upstream has arrived that should not have — somebody will breathe in, hold it, and say:

“Smells like money.”

That is the main one. It is said perhaps twice a week and it has never once been funny and it is never going to stop, and the day somebody new says it for the first time is the day they have arrived.

If you use the facilities on site, on your way back somebody will say, without looking up:

“Thanks for the job security.”

A man on nights has called himself a connoissewer for so long that nobody remembers him saying the other word. He claims he can tell

the two headworks lines apart by nose. He can. That is the irritating part.

And when the annual report goes out, or when somebody in administration circulates a summary of the year's tonnages, one of a handful of people will reply-all with two words.

"Gross profit."

I have watched a director's assistant learn not to respond to that email.

None of it is clever. That is the point of it. It is the same six jokes for thirty years and everybody knows all of them and everybody laughs at about a fifth of them, and a new person is not in the crew until they have heard all six and made none of them.

There is a seventh which I am not going to write down, and which the senior operator says about once a year, and which is genuinely funny and would not survive being in a document.

. . .

THE VISIT.

School groups come through about every second week in the spring and one of them came through headworks in April.

They do not come into the enclosure. There is a viewing position on the walkway and the extraction is running and the group stands there for three or four minutes.

The teacher had prepared them, which some do and some do not, and one of them asked me what the worst part of my job was.

"Paperwork."

"No, the *worst* part."

"Paperwork."

That got a laugh from the teacher and a look of genuine disappointment from the child, and I have thought since that I gave him a stock answer and that he had asked a real question.

The actual answer is Sunday nights in February when the phone goes at eleven.

The one that stuck with me was from a girl at the back who did not ask a question at all and who, at the end, while the others were

putting their high-visibility vests back in the box, said, “Somebody has to do this.”

She was not being kind. She was working something out.

. . .

THE PLANT THAT DOES NOT STOP.

There are more than twenty projects running on this site.

Not sequentially. At once. Expansion, seismic upgrades, odour control, a new outfall, a co-generation facility, a digester, a control building. Contractors on site every day, cranes up, a lay-down area where there used to be parking, and a construction schedule that runs to the middle of the next decade.

And the plant runs. Every day, through all of it, at full flow, treating what a million people produce, because the alternative to running is not running.

The tie-ins are the part that operations lives with. Somewhere in that schedule is a night when a new pipe gets connected to a running one, and there are dozens of those over the programme, and every one is a plan and a rehearsal and a window and a set of people who do not sleep beforehand.

I have been on four. None of them went wrong. That is not luck and it is not skill exactly; it is the amount of preparation that goes into a thing that cannot be undone.

9. REPORT ANY RAG ACCUMULATION ON DOWNSTREAM EQUIPMENT TO THE SHIFT SUPERVISOR. DO NOT CLEAR IT YOURSELF.

. . .

There is an operator here who has been on this site thirty-one years and who is the person you send when something is odd rather than broken.

I asked him once what had changed most.

“Rag.”

“Not the plant?”

“Plant’s bigger. Plant’s better. Rag’s the change.”

He came here in 1994 to a facility with a fraction of the process it has now and about half the people, and the thing he wanted to talk about was a skip.

“Went out half as often. Maybe less.”

“And what was in it?”

“Different. It was — ” and he thought about it for a while, long enough that I thought he had finished. “It was things people had dropped.”

Now it is things people have bought.

He is not sentimental about the nineties. He says the plant was harder to run and the effluent was not as good and the safety culture was, in his words, not what anybody would want to describe in detail.

What he has an opinion about is the construction.

“Twenty projects.”

“About that.”

“On a running plant.”

“Yes.”

“They did the same in 2004.” A pause. “Fewer.”

He is neither impressed nor unimpressed. He has watched this site be rebuilt around him twice and he expects to watch a third of the current programme finish before he goes, and his only observable position on any of it is that he would like the lay-down area to stop being where the parking was.

. . .

THE NIGHT.

The tie-in I was on that I remember properly was in February and lasted from ten at night until about five.

There is a rehearsal, which people outside do not expect. You walk it, on the actual plant, with the actual people, at the actual time of day, some days before, and you do everything except the cut.

Then on the night there are about thirty people on site and most of them have nothing to do for hours, which is correct, because the

ones with something to do need the ones with nothing to do to be there at the moment the thing changes.

My job for four of those hours was a level and a radio. That was it. Watch a level, say the number every fifteen minutes, say it immediately if it moves.

At about half past two the number moved and I said it immediately, and it moved because the thing that was supposed to happen had happened, and somebody said copy, and that was my entire contribution to a project of that size.

It went. By five the new work was carrying and the old line was dead and there was a photograph taken which I am in and in which I am holding a coffee.

. . .

The manifest

0602.

“Morning.”

“Morning. Two waiting.”

“Numbers?”

“One’s on the list. One isn’t.”

“Is he arguing?”

“Not yet.”

. . .

Trucked liquid waste. This is the receiving station and I am on the intercom and the gate.

Not everything is on a sewer. Septic tanks. Holding tanks. Portable toilets from sites and events. Recreational vehicles. Grease interceptor pumpings from the food sector. Certain non-domestic loads under authorization.

All of it has to go somewhere and the somewhere is here, on a schedule, with paperwork.

Every hauler needs an authorization. Every load needs a manifest. The manifest says what it is, where it came from, when it was collected, who collected it. The number on the truck has to match the number on the list. The list comes out of the Sewage Control Manager’s office and it is not my list and I cannot add to it.

That is the basis of my working relationship with every driver in this region.

0611.

“He says he phoned.”

“Who’d he phone?”

"He doesn't know."

"Then he didn't phone."

He might have phoned. People do phone. But a phone call is not an authorization, and the authorization is a number, and either the number is on the screen or it is not.

He comes to the intercom himself, which they do.

"I've been coming here nine years."

"I know."

"Nine years."

"Your number expired on the thirtieth."

"Nobody told me."

"There's a renewal notice. It goes to the address on the file."

Pause.

"What address is on the file?"

And there it is. Ninety seconds. An address he moved out of in the spring. The renewal went to a building he does not occupy. He is not lying. He is not lax. He is going to have a bad Tuesday.

I cannot let him tip. I tell him who to phone. He phones from the cab in the lay-by. I watch him do it. Forty minutes. Back at the gate at eleven with a number.

He does not thank me and I would not either.

. . .

0720.

"Manifest says Coquitlam."

"Right."

"Source says a strata."

"Right."

"It's a strata with a lift station and the lift station's on the sewer."

Silence.

"So what's in the truck?"

That one takes longer. What is in the truck is a holding tank from a site that is not on the manifest. The reason is not sinister. He did two jobs and wrote one. There is a version of this conversation about

honesty and a version about paperwork. The second works. The first does not.

He does it again. On the form, properly, both loads. I take the load. It goes in the file. Twice more and it goes somewhere else.

. . .

0845.

Portable toilets from an event on the weekend. Four trucks, booked in advance, which is how it should be done. Through in an hour and a quarter. I have almost nothing to do with them.

The good ones are invisible. That is worth saying. The bulk of the haulers in this region are competent operators running a legitimate business with the paperwork done, and the reason my day is a series of arguments is selection bias about who I have to speak to.

. . .

0910. LONG WEEKEND TUESDAY.

“There’s a motorhome at the gate.”

“Course there is.”

Three of them by half past. It is the Tuesday after a long weekend and this happens every long weekend and will happen after the next one.

“Morning. Are you a registered hauler?”

“I’m sorry?”

“Do you have an authorization number?”

“I’ve got a holding tank.”

“I know. Are you a hauler?”

“I’m from Langley.”

That is the shape of it every time. He is a completely reasonable man with a full tank at the end of a weekend who has looked up where waste goes and has driven to where waste goes, and there is a species of logic in that which I cannot fault.

I give him the two nearest sani-dumps and the hours, and I write them on a card, because I have cards, because this happens enough that somebody in administration had cards printed, which is the single most quietly humane thing this organization has ever done for me.

Four times out of five that is the end of it and he thanks me.

The fifth one wants to know why not. The answer — a permitted facility, authorized loads, under manifest, and a motorhome is not a load under manifest — is true and satisfies nobody. The version that works: the machine at the front of my station is not built for what is on the back of his vehicle. Also true. More use.

0955.

“He’s still there.”

“Which one?”

“Langley.”

“Doing what?”

“Looking at the sign.”

. . .

1015.

Out-of-region load.

There is a truck at the gate with a manifest from outside the service area and this is the one that comes up perhaps twice a month and is never simple.

Waste generated outside the region has to be authorized specifically. That is not protectionism. The plant is sized and permitted for this region. The receiving station is not a general disposal facility. And there are places where somebody has worked out that two hours’ driving is cheaper than dealing with a load properly at home.

This one is fine, as it turns out. He has the specific authorization, he has the paperwork, and he is patient while I read it, which takes a while.

“You’re all right. Take your time.”

“Sorry. It’s the out-of-region ones.”

"No, take your time." He leans on the door of the cab. "If somebody can get in here without that, then what's mine worth?"

Which is exactly right, and it is the most sophisticated thing anybody says to me in a week, and he says it the way you would say something about the weather.

. . .

1105. GREASE.

The interceptor haulers are their own trade. Their rhythm is early and consistent. They are the only category I have never had an argument with.

The one who has been doing it twenty-two years talks at the intercom while the pump runs.

"How's it looking out there?"

"Same."

"Same good or same bad?"

"Same." A pause. "The new ones are worse."

His view, offered about once a month and never solicited, is that a restaurant that has been open fifteen years knows what an interceptor is and a restaurant that opened last year does not, and that the industry churn is the reason his round has got harder rather than any change in what people cook.

"They think it's a drain."

"It is a drain."

"It's a *box*."

That distinction matters to him more than it matters to anybody, and he is right about it, and I have started using it.

. . .

1140.

"After-hours request.

"For when?"

"Tonight."

"Notice is forty-eight hours."

"He knows."

"Then why's he asking?"

"Says it's an emergency."

Everybody's is an emergency. Sometimes it is. There is a mechanism. It goes to somebody above me. It gets granted about a third of the time. When it is granted there is a public health reason, not bad planning.

This one is a failed lift station at a care facility and it is granted inside twenty minutes.

. . .

1150.

"Do you get bored?"

That is the new administrator, who has been in the office six weeks and who has come down to see what the station actually is, which is more than her predecessor did in four years.

"No."

"You're on an intercom for eight hours."

"I'm on an intercom for eight hours and about forty vehicles come through and every one of them is a person."

She thinks about that and says it is a good answer and I say it is the answer I have prepared, which it is.

What I do not say, because it takes longer than she has, is that the boredom question assumes the job is watching, and the job is not watching. There is a set of rules about what may be received. There is a set of people who would prefer those rules applied to somebody else. I sit on the line between them for eight hours. Then I go home.

. . .

1215.

"You had lunch?"

"Not yet."

“There’s a sandwich in the fridge with your name on it.”

“Whose name?”

“Yours.”

“That’s not what I asked.”

The station fridge is a running dispute that predates me by years and will outlast me. There are two of them. One is for lunches. One is for samples. Labelled. Locked. The lock went on after an incident in 2019 that gets referred to constantly and that nobody will describe to me.

I have asked four people. Two of them said to ask somebody else and two of them said it was before their time, and one of the ones who said it was before their time started in 2016.

. . .

1225. THE DECK.

What a discharge actually looks like, since I have described a lot of paperwork about it.

The truck backs onto the pad. The driver gets down. Opens the cabinet on the side. Pulls out the flex hose, which is heavy and which he handles the way you handle something you have handled ten thousand times. Dragged, not carried. Dropped on the deck with a sound that carries across the yard.

Then the coupling. Then the valve. Then the pump if it is a pumped discharge. Gravity if it is not. Gravity is slower and quieter. The drivers prefer it. Less to go wrong.

The vacuum relief on the tank hisses when it breaks, every time, at the same point in the cycle, and I have been here long enough that I know from the office how far through a load a truck is without looking at it.

Eight to fourteen minutes for a standard load. Twenty if he is being careful with the rinse.

Then the hose goes back in the cabinet wet, and it stays wet, and that is the part of his day nobody sees.

. . .

1240. THE REJECTION.

One load turned away today.

Manifest incomplete — source not stated, collection date blank, and the driver's own portion unsigned. That is not a technicality about tidiness; a load with no stated source is a load nobody can trace if it turns out to contain something.

"It's septic. It's a house."

"Which house?"

"It's on the ticket in the truck."

"It needs to be on the manifest."

"It's the same information."

"It's not on the manifest."

Twelve minutes. He is not aggressive at any point. A man with a full tanker, four hours of his day gone, nowhere to put it. His voice gets tight. That is arithmetic, not temper.

He takes it away. He cannot legally put it anywhere else. He comes back tomorrow with a completed manifest. The cost is his.

I have thought about whether I could have taken it and written the source in myself off his ticket.

I could have. It would have been the same information on the same day about the same tank.

It would also have been a document completed by the receiving station about a load the receiving station did not collect, and the reason I do not do that is not that I am a stickler. It is that the manifest is the only thing standing between this station and being the place where anybody can put anything.

He came back at ten past eight the next morning with it done.

. . .

1320.

The Chaos-Weaver has the afternoon.

He takes the awkward ones and the awkward ones are: expired numbers, disputed manifests, out-of-region, after-hours, anything with a note.

The line at half past one is seven trucks and two of them are trouble.

At half past three it is clear.

I have looked at the log for that afternoon because it is the log and it is in front of me. Seven received. Seven manifests complete. No rejections, no rework, no phone calls above the station.

I heard about a minute of one of them over the intercom. The driver had an expired number and had come to argue about the renewal notice, and what he got asked was where he keeps his invoices. Not the notice. The invoices. Forty seconds later the driver was telling him about an office move in March and had stopped arguing about anything, because the office move was the matter, and neither of them had said so.

He never explains it afterwards. I asked once and got a shrug that was not evasive, and I have come to think there is nothing there to explain — that the question about the invoices was not a tactic and was simply the next thing to say.

. . .

1440.

“Weighbridge is out.”

“Since when?”

“Half twelve.”

“Nobody told me.”

“I’m telling you.”

The weighbridge is not how loads are measured — the meter is — but it is used for a set of secondary purposes and its being out generates a number of small inconveniences across an afternoon and four phone calls, three of which come to me.

It has been out four times this year. Each time it is the same fault. Each time it is repaired under a service arrangement by a contractor who drives in from the valley. Each time somebody says the arrangement should be reviewed. It has been reviewed twice. It has not changed. Costed properly, the contractor is cheaper than the alternative even at four visits.

That is not a failure of anything. That is somebody having done the arithmetic properly and everybody else finding the answer annoying.

. . .

1455.

“Reconciliation’s out.

“By what?”

“Point four of a cube.”

“On what?”

“On the day.”

The receiving station meters what comes in. The manifests state what is in the trucks. Those two numbers are supposed to agree and they never agree exactly, because a manifest is a driver’s figure and a meter is a meter.

Today the meter total is higher than the manifest total by four hundred litres.

Which is the wrong direction. The manifest total should be the high one — drivers round up, tanks are not full, and there is always a residual left in a truck. In eleven months here I have never once had it come out the other way.

It goes on the sheet as a variance and the sheet goes to administration and the disposition on it, when it comes back three weeks later, is *within tolerance, no action*.

The tolerance is a per cent of daily volume and four hundred litres is inside it, so that is correct, and the sheet is filed.

. . .

1520. FRIDAY.

There is a hauler who brings two coffees on a Friday and has done since before I started.

He does not want anything. His paperwork has never been wrong — not once in the eleven months I have been on this gate, and the

man I took over from said the same, and he said it in the tone of somebody handing over something valuable.

“Two sugars?”

“None.”

“None.”

“None.”

He puts it on the ledge, and he does his load, and he goes.

The first month I assumed there was something coming. There is not. It is Friday and there are two coffees.

. . . .

1602.

“Anything for nights?”

“One at seven. Booked.”

“Grand.”

Off at ten past.

The rate

Wednesday, ten o'clock, process meeting.

Six of us round a table with the trend screens up: two operators, the process engineer, the laboratory, the supervisor, and the Allfather, who runs operations and who says less in an hour than anybody else in the room.

The subject is solids retention time and it is the subject most weeks.

. . .

Secondary treatment is a biological process. That sentence gets said in tours and it does not convey anything, so here is what it means operationally.

There is a population of micro-organisms in the aeration tanks. They consume the organic material in the wastewater. They are held in suspension by aeration, they flocculate, and then in the secondary clarifiers they settle out, and the settled material — activated sludge — is returned to the front of the process to keep the population up. That is the return activated sludge, the RAS, and it runs continuously.

A proportion is not returned. That is the waste activated sludge and it goes to the solids side. Wasting is how you control the population size.

Solids retention time is the average time a particle of that population stays in the system before it is wasted. It is not a setting on a panel. It is a calculated figure that comes out of your inventory, your wasting rate and your effluent solids, and you steer it by changing what you waste.

Too short, and you do not have the population to do the work, and the effluent goes off.

Too long, and you have an old population that settles badly and takes up clarifier capacity you will want when it rains.

That is the discipline, and everything in the meeting is a version of it.

. . .

THE NEW ENGINEER.

Her first process meeting was in September and I have rarely felt for anybody more.

She is a good engineer with a good degree and eighteen months at a consultancy, and she sat down at ten o'clock into the following, which I have reconstructed from my own notes and which is not exaggerated:

"MLSS is up."

"SVI?"

"One forty."

"On the thirty or the diluted?"

"Diluted."

"Then it's worse than one forty."

"RAS is at sixty."

"Sixty of what?"

"Of influent."

"Say per cent."

"Sixty per cent."

"WAS?"

"Where it was."

"F over M?"

"I haven't got F over M in front of me."

"Then how do you know MLSS is up."

By twenty past ten she had written down eleven acronyms and, I found out later, had guessed at four of them and got two right, which is a better hit rate than I managed in my first year.

At about half past somebody said *the ditch* and she wrote that down as well, which is fair, because in this industry it might have been a process.

Afterwards she asked me for a glossary. There is no glossary. There has never been a glossary. There is a document from 2011 called *Terminology* which is eleven pages long, is wrong in about six places, and refers to a treatment train that was decommissioned before it was written.

I gave it to her anyway and told her which six.

She is now the person in that room who says *say per cent*.

. . .

BULKING.

Three weeks earlier the index had gone the other way and gone hard, and that was a different meeting.

A sludge volume index tells you how well the population settles. When it climbs, the sludge occupies more volume for the same mass, and the clarifiers fill with something that will not compact, and eventually solids leave in the effluent, which is the thing the plant exists to prevent.

The cause is usually filamentous organisms. They grow as long strands rather than as compact flocs, and a floc with filaments extending out of it will not settle, because it has the hydraulic behaviour of something much larger and much lighter.

You do not find that in the numbers. You find it under a microscope.

The laboratory technician who does that work put a slide up on the screen in the meeting room and said a genus name and a morphology, and then said what it indicates, which is a specific set of conditions in the aeration tanks — low dissolved oxygen in this case, in a particular zone, at a particular time of day.

“How confident?”

“On the identification, confident. On the cause, that’s the usual one for that organism.”

“Usual meaning?”

“Meaning if you fix the DO profile and it goes away, it was that.”

Which is a completely honest statement of what microscopy can and cannot support, and the response to it was an air distribution change and a week of watching.

It went away.

Nobody has ever established that the DO was the cause and nobody ever will, because the test was the fix.

. . .

The numbers this week are: mixed liquor suspended solids up slightly, sludge volume index up more than slightly, effluent ammonia stable, and the wasting rate where it was set three weeks ago.

The process engineer wants to increase wasting. Her reasoning is the settleability — the index is where it is because the population is older than she wants and the answer is to take more out.

The laboratory has a caveat about the index method and how it behaves at this concentration, which is a real caveat and is not a challenge to her conclusion.

One of the operators does not want to touch it. His reason is the forecast: there is weather coming Friday and a plant heading into a wet-weather event with a reduced inventory is a plant with less to work with, and inventory takes days to rebuild and rain takes hours to arrive.

Both of those are correct. That is the meeting.

. . .

AIR.

The single largest thing this plant buys is air, and almost nobody outside operations knows it.

The blowers that put oxygen into the aeration basins are the biggest electrical load on the site by a wide margin — more than the pumps, more than everything in the solids building put together. Somewhere around half of the plant's electricity goes into pushing air through water.

So every process decision has an energy number attached to it whether anybody says so or not. Running a longer solids retention time costs air. Nitrifying costs air. Holding a larger inventory going into a wet season costs air.

There is a control system that trims the blowers against measured dissolved oxygen, and it works, and the argument about it is the same argument everywhere: how tightly to trim. Trim hard and you save money and you have no margin when the load arrives. Trim loose and you are paying to keep a population more comfortable than it needs to be.

The setpoint on this plant has been changed four times in nine years and every change was argued for a month.

. . .

CLARIFIERS.

The secondary clarifiers are the part of the process that people photograph and are the part I would defend if the plant had to be defended by one component.

They are large circular tanks with a slowly rotating bridge across them, and what happens in them is nothing, deliberately. Flow enters at the centre, moves outward at a decreasing velocity, and the solids settle because they are heavier than water and because they have been given time and quiet to do it.

There is no chemistry. There is no energy input beyond the bridge, which turns at about a revolution every half hour. It is the least active part of the process and it is where the process either works or does not.

Everything before it — the aeration, the return, the wasting, all the argument in that meeting room — is about producing a population that will settle in those tanks. That is the actual objective. Treatment is what happens in the aeration basin and success is what happens in the clarifier, and they are two different measurements and it is possible to have the first and not the second.

That is the thing about biological treatment that I could not get into anybody's head at family occasions until I stopped trying. It

is not filtration. Nothing is straining anything. You are cultivating something that will consume what you want consumed and then, when you have finished with it, agree to sink.

. . .

THE FOAM.

There is foam on the aeration deck about a third of the year and there is a thick brown stable variety of it that is associated with certain organisms and that is a nuisance, a hazard on walkways, and photogenic.

It gets photographed from the road perhaps twice a year and once it went further than that.

The conversation with communications was short and went well.

"They're calling it a chemical spill."

"It's foam."

"Can I say that?"

"It's biological. It's the organisms. It's on the surface because they're hydrophobic and the aeration floats them."

"Can I say *hydrophobic*?"

"You can say it's a known thing that happens at treatment plants and we manage it with sprays and by changing how we operate."

"Is that true?"

"That's exactly true."

That went out and it was accurate and it was the end of it. What I noticed at the time and have thought about since is that she asked *is that true* rather than *will that work*, and that the answer to the first one is what got it past the second.

. . .

The temperature comes into it, which people do not expect.

The process is slower when it is colder, because the organisms are slower, so the population you need in winter to do the same work is larger than the population you need in August. That is why a plant that is comfortable in July can be at its limit in February with the

same load, and it is why the wasting strategy is seasonal, and it is why a plant designed on annual averages is a plant designed wrong.

We are in the shoulder now. The engineer's numbers are August numbers and the operator's instinct is a February instinct and it is the third week of October.

. . .

THE DECK.

The aeration deck in winter at half past six in the morning is the one place on this site that I would take somebody to if I were trying to explain the job, and I am not going to describe it, because every time somebody in this industry describes it they make it sound like a cathedral and it is a rectangular concrete tank with air going through it.

What it is, physically: a long basin with diffusers across the floor and enough air coming up through the water that the surface is in continuous motion. It steams in the cold. It is loud.

The reason to stand there is that you can see the process. Not on a screen — in the tank. The colour is a real diagnostic. So is the pattern of the boil, which tells you about the diffusers underneath it. So is the foam and how it moves and where it collects.

Operators walk it every shift and note things that no instrument on this site reports, and those observations go in a log, and the log is read.

I have twice raised something off a walk that turned out to matter. Both times I was not sure what I was looking at and said so, in the log, in those words.

. . .

THE NIGHT IT WENT OFF.

The one time in nine years I have watched this plant fail to do its job was a Tuesday in March and it took eleven hours to fix and about six weeks to understand.

Effluent solids climbed through the evening. Not a spike — a climb, steady, from a number that was normal to a number that was not, over four hours, with nothing else moving.

Flow was ordinary. Loading was ordinary. Dissolved oxygen was where it should be. The wasting rate had not been touched in nine days. Every input to the process was where it had been the day before and the day before that, and the output was going the wrong way.

I was on the desk. I did what you do, which is check that the instruments are telling the truth, and they were, and then check the clarifiers, which is a walk.

“What’s it doing?”

“Blanket’s up on two and four.”

“How far up?”

“Far enough that I’m telling you.”

You can see a clarifier failing. That is the thing about them. Everything else in this plant you find out from a screen, and a clarifier tells you by looking wrong — the surface goes from clear to a kind of turbid grey-brown, and then you start to see the blanket come up the sidewall, and once it is over the weir you are putting solids into the river.

We took two out of service and pushed the flow through the others, which buys you nothing except time, and time is what you want.

The process engineer came in at eleven at night and did not go home for two days.

WHAT IT WAS.

A polymer feed had been running at half the intended rate for nine days.

Not failed. Halved. A pump had been set back during a maintenance activity and the setpoint on the panel read what it was supposed to read, because the setpoint is a command and not a measurement, and the actual delivered dose was half of it and nothing in the system was checking.

Nine days at half dose does not do anything for eight of them. The floc gets progressively less robust and the settling gets progressively worse and every individual day is inside the range, and then on the

ninth day there is weather and a bit more flow and the thing that has been quietly degrading for a week has no margin left.

Which is why it looked like nothing had changed. Nothing had changed on the Tuesday. Everything had changed nine days earlier, in a couple of seconds, when somebody turned a dial back and did not write it down.

Nobody was disciplined. The maintenance activity was authorized, the person doing it did what they were asked, and the gap was that the delivered dose was not verified against the setpoint anywhere in the system, which is a design gap and not a person.

The fix was a flow meter on that line and an alarm on the deviation. It cost eleven thousand dollars and took four months to get through capital, and I have thought since that the four months is the more interesting number.

. . .

AMMONIA.

The other standing argument is nitrification, and it is a good argument and neither side is being difficult.

Nitrifying organisms convert ammonia through to nitrate. They are slower-growing than the rest of the population, they are more temperature-sensitive, and holding them requires a longer solids retention time and more air, and air is the largest electrical load on this site by a distance.

The permit does not require it here.

The engineer's position is that we should run for it in the shoulder season anyway, because ammonia is toxic to fish at concentrations well below anything the permit contemplates, and the receiving environment is a river.

The supervisor's position is not that this is wrong. His position is that running a process beyond permit is a commitment, that an intermittent commitment is worse than none because the receiving environment gets a variable input rather than a consistent one, and that the moment you demonstrate you can do a thing you will be asked to do it always and the capital to do it always does not exist.

“So we do it badly or not at all.”

“We do it as a decision or we do it as a habit. A habit’s what gets you in trouble.”

They have had that argument at least four times and neither has moved and both of them are content, and the current position is that we run for it when it is free and do not chase it when it is not, which is precisely the fudge both of them warned about and which both of them signed.

. . .

The Allfather says a number of hours.

He is asked, directly, by the supervisor, what the flow does on Friday. Not what he thinks; what it does.

There is no pause. He says it starts at about half past two on Friday afternoon and comes off peak at about eleven that night, and gives a peak figure, and it arrives at the speed of somebody reading aloud.

The engineer asks what that is based on and he says the ground.

That is the answer. He does not expand it and nobody presses, because it is a normal thing for an operations person to say — the antecedent moisture condition governs how much of a rainfall becomes flow, and everybody in that room knows it, and it is a completely standard basis for an estimate.

What is not standard is a time and a figure rather than a range.

The supervisor writes it on the whiteboard as a range.

. . .

THE CORRECTION.

The decision is a partial increase in wasting: less than the engineer wanted, more than the operator wanted, held until Friday and reviewed after.

That is a compromise and it is not a fudge. It moves the index in the right direction without spending the inventory the operator

wants for the weather, and it can be reversed on Monday if the weather does what it is expected to do.

Then the process engineer corrects herself.

She has been through her own numbers while the discussion was going on and the inventory figure she used in her calculation was yesterday's, not this morning's, and this morning's is lower, and with this morning's the increase she proposed is larger relative to inventory than she intended.

She says so. Out loud, at the table, before anybody has acted on anything.

The revised increase is smaller than her original proposal and larger than nothing, and the meeting agrees it in about ninety seconds, and the minute records the revised figure and does not record that there had been another one.

. . .

STARTUP.

The one time I have seen a train started from nothing was in my second year, on the new works, and it takes longer than anybody expects.

You cannot buy the population. There is no product you order. What you do is seed the new basin from an existing one — take mixed liquor from a running train and put it in the empty one — and then feed it, and wait, and watch a set of numbers do very little for two weeks.

Then it goes. The oxygen uptake climbs, the solids build, the settleability comes in, and at some point in the third or fourth week somebody says the train is on and nobody can identify the day it happened.

Commissioning engineers hate this part, because there is a schedule with dates on it and the biology does not read the schedule. There was a meeting during that startup where somebody asked what the mitigation was if the population did not establish on time, and the process manager said feed it and wait, and was asked for an alternative, and said there was not one.

He was right. Nine days later it was fine.

. . .

FRIDAY.

I am on shift for it.

Rain from about eleven in the morning, steady, nothing dramatic. Flow flat through midday. You watch the trend and there is nothing in it and you begin to think about whether the meeting was worth having.

Twenty-five past two the line lifts.

It does not spike; it lifts, and keeps lifting, and by four we are at a multiple of dry weather flow and everything downstream of the headworks is being asked a question.

The clarifiers are the answer to the question. A clarifier at high flow has less time to do the same job, and whether the solids stay in it depends on how well they settle, which depends on the inventory and the index, which is what we spent an hour on Wednesday arguing about.

They hold.

There is a period around seven where the blanket is higher than anybody wants it, and the operator on the desk and I stand and look at the same trend for three or four minutes without saying anything, and then it stops climbing.

The Allfather is on the radio twice. Once at four with a rate for the return, and once at nine to say it will come off at about eleven.

Peak is inside the figure he gave. It comes off at about ten past eleven.

The clarifiers hold, which they would not have if the wasting had gone up the way it was first proposed.

On Monday somebody says it was a good call to hold some inventory, and the operator says nothing, and that is the meeting.

Entry

DIGESTER 4 — INTERNAL CLEANING. SHIFT LOG, DAY 1 OF 3.

SIX WEEKS BEFORE.

The planning meeting for a digester entry runs two hours and is attended by more people than will be on site.

Sequence. Isolation — which valves, which blinds, whose locks. Ventilation arrangement and how it is proved rather than assumed. Who holds which ticket and whether we have enough of them for three days including the day somebody is sick. What the rescue arrangement is, in writing, with the response time in it.

The argument that meeting has every time is whether three days is enough.

“It’s three days if nothing’s seized.”

“Something’s always seized.”

“Then it’s four.”

“We haven’t got four.”

The person who settles it is a millwright who did the last one and who says what actually took the time in year one, which was not the mechanical work and was not the grit. It was the two hours a day of getting in and out.

Four entries a day, four exits, atmosphere retests, tools down and tools up. Two hours of the working day on transitions rather than task. No way to reduce it. Every one of those transitions is a control, and the controls are the reason people come out of tanks.

Three days, with the sequence changed so that the seized items get found on day one.

. . .

0545. On site. Digester 4 has been out of service eleven days. Contents removed, washed down, ventilated continuously since the fourth.

0600. Toolbox. Nine people: four entrants, one attendant, one entry supervisor, two on the winch and top-side support, one standby rescue.

There is a full-sized digester on this site with a permanent internal structure. It is inspected and repaired on a cycle. Three days. About a hundred and forty hours of labour. One of the most heavily controlled operations this plant does.

Digester 4 is a heated tank, thirty-five degrees, sealed, three-week retention. Biogas off it: methane, carbon dioxide, water vapour, hydrogen sulfide.

Hazardous location rating on everything that goes in. No phones past the barrier. This is written down elsewhere and is written down here because the last crew wrote it down here.

THE ONES WHO DO NOT GO IN.

Two of the nine are standby rescue and their function is to not be needed.

They sit at the hatch for three days with a tripod, a winch, harnesses, a resuscitator and airline sets. They do effectively nothing. One of them reads.

I asked the lead what the training consists of and he said mostly it consists of not going in.

Not going in is the hardest thing they do. The rescuer statistic is the rescuer statistic. Whatever took the first person is still in there.

“So what do you actually do?”

“We get you out from up here. That’s the plan. Every plan starts with the winch.”

“And if the winch won’t do it?”

“Then we go in on air, in sequence, and somebody stays at the hatch. Nobody goes in because they want to.”

He said that last part twice in a three-day job, both times conversationally, both times to somebody new.

0625. Atmosphere test at the hatch. Oxygen 20.8. LEL zero. H2S zero. CO zero.

0630. Permit issued. Attendant in position.

. . .

The attendant is the Companion and she has been on this entry every year I have been here.

There are four names on that permit and one of them is hers and hers is in a different box. The entrants come and go — this year there are two people on it who were not on it last year — and she is at the hatch.

What she actually does for three days is stand.

The permit says the attendant maintains continuous communication with the entrants, maintains an accurate count, monitors conditions inside and outside the space, and does not enter. That is the list. It occupies perhaps five per cent of the available attention and the other ninety-six is the job.

Some attendants fill it by reading. Some fill it by talking to whoever is topside. She does neither.

What she does instead — and I did not work this out for two years — is that she knows where everyone is.

Not on the board. The board has four names on it and everybody can read the board. She knows that the second entrant is on the north side working overhead and has been for forty minutes and will want to come out before the retest, and she says so to the entry supervisor before he asks, and the supervisor plans around it.

She does that for four people continuously for three days.

0641. First entrant in. Tools lowered separately.

0655. Second entrant in.

0712. Third and fourth.

0715. She calls the first entrant by name and asks him to confirm.

That is in the procedure — communication is tested at intervals — and most attendants do it as a radio check. *Comms check, entrant one.*

She uses names and she asks a question that has an answer in it. Not *are you okay*, which gets a yes from a man who is not okay. She asks what he is doing.

He tells her what he is doing.

I asked her about it once, in the fourth year, at the hatch, while the others were at lunch. She said if they tell you what they are doing you know four things instead of one.

That is the only technical conversation I have ever had with her and I have thought about it since, because the four things are: he can hear you, he can speak, he knows where he is, and he knows what he is meant to be doing. A yes gets you the first one.

0730. Atmosphere retest. Stable.

. . .

Notes on the interior, for whoever has this next. A large clean concrete space. A mixing structure in it. Residue on the walls, washed but not removed. Warm, because the tank is warm. The light is what you bring.

The work is inspection and repair on the mixing gear and the internal pipework. And grit removal. Grit accumulates in the bottom of a digester over years and reduces the working volume. Nobody notices until the retention time is not what the calculation says.

There is a considerable amount of grit.

ISOLATION.

Longest part of the job. Proving the tank was safe to open.

Gas lines, feed lines, recirculation, heating, mixing, overflow. Every one a route by which something arrives in a space with people in it. No permit until every one is positively isolated.

Blind, not valve. A plate in the line, so nothing passes regardless of what anybody does at a panel three buildings away.

Fitting blinds takes two days. It is done by people who are not the entry crew. Each one is recorded on a register. The entry supervisor checks the register against the drawing, on the drawing, with a pen.

The gas side gets the attention it deserves. A digester makes methane, and the line that takes it away is blinded, and it is blinded at both ends.

I have watched a supervisor walk a blind register twice, five hours apart, on the same day, because he had been interrupted the first time.

. . .

The grit is the work nobody costed properly.

It comes out of the bottom in a layer. Not the fine grit from the front of the plant. What got past the front of the plant over years and settled where the mixing does not reach. It is dense and it is heavy and it comes out in buckets on a rope.

Buckets. On a rope. In a facility with several hundred million dollars of construction going on around it.

No machine will do it. A machine that would do it will not fit through a hatch that size. The hatch is that size because a larger hatch is a larger structural opening in a pressure-retaining tank.

Two people fill, two people haul, and you rotate every forty minutes because of what it does to your back.

The reason nobody knew how much was in there is that the only way to know is to open it, and you open it on a cycle measured in years, and in between you are working from a design volume and a calculation.

The retention time we thought we had and the retention time we actually had were not the same number. They had not been for some time. Nothing bad happened. The process ran fine. Which ought to be unsettling and is not.

. . .

0900. Break. Entrants out, permit remains open, attendant remains in position.

0915. Re-entry.

1030. Atmosphere retest. Stable.

1145. Lunch. Entrants out.

. . .

One millwright on this job has worked with her for eleven years and who does not speak to her at the hatch beyond the required exchanges.

That is not coolness. He is one of the ones who does not talk when he is in a space and does not talk on the way out, and it takes about a year with somebody to know that about them, and she has known it for eleven.

So she does not ask him what he is doing. She asks him for a number, which he gives her, and that is their communication check and has been since before I started here.

Two different people, two different procedures, same clause.

1220. Re-entry.

1402. ENTRY TERMINATED.

The reason is that the ventilation blower on the south side changed note.

It did not stop. It did not alarm. It changed note. The attendant heard it change note. She called the entry. Four people came out of a tank in about six minutes, work half done, tools still in it.

The blower was fine. It was drawing on a partially obstructed intake. That reduced flow. That changed the sound. The atmosphere in the tank never moved and would not have moved for a considerable time.

It took ninety minutes to clear the intake, re-test, re-issue the permit and get everybody back in, and that is ninety minutes off a three-day job that was already tight.

Nobody said anything about it. Not at the time and not afterwards.

I have been in the trade twenty-two years and I have watched entries called for less and I have watched entries not called for more, and the second one is the one that keeps people up.

1535. Re-entry.

1710. Entrants out. Permit closed. Day 1 complete.

. . .

WHERE IT GOES.

What comes off a digester is gas, and the gas is the reason this arrangement pays for itself twice.

Methane, mostly. It is scrubbed. It goes to engines on this site that generate electricity and recover heat. The heat goes back into keeping the digesters at thirty-five degrees, which is what the process wants. The electricity offsets what the plant draws.

A proportion of what this site consumes it makes out of what it is treating.

I have heard that put grandly at open days and it does not need to be. It is a boiler and a set of engines and a gas train, all of it commercially available, none of it exotic, and the reason it is here is a business case.

What is left after digestion is dewatered and becomes biosolids. Biosolids go out by truck, to land, under a programme with its own regulation and its own agreements. The arguing about that is done three floors up from me.

. . .

THE ONE WHO STOPPED.

One man on this crew is ticketed, current, and has not entered a confined space in six years.

He is on the tripod. He is on the winch. He does the atmosphere testing. He is better at the paperwork than the rest of us put together. Nobody who matters has ever asked him to explain himself.

He told me the reason at a tailgate, unprompted, in about fifteen seconds. He was in a wet well in 2018 when a man in the next chamber along went down. Different job, different crew, different employer. The man lived. He was not involved in getting him out and there was nothing he could have done and nobody has ever suggested otherwise.

“And I got out of my hole and I thought, no.”

“And that was it?”

“That was it. Six years.”

He said it the way you would say you had changed trades. There was no apology in it and no request for anything and no expectation that I would have a response, and when I did not have one he asked me whether the bar had come back from the hire place.

Nobody on that crew treats it as a failing and nobody has ever, in my hearing, referred to it at all. He is on the permit as an attendant and as top-side support and he is one of the best in the section at both.

. . .

1745.

Kit off, and the conversation at the vans is about whether the pub is a good idea on a three-day job.

“It’s day one.”

“It’s the only day it works. Day two you’re wrecked and day three you’re going home.”

“That’s a whole philosophy.”

“That’s the job.”

The rookie asks whether we always go and three people give him three different answers, all confident, all wrong in different directions, and the actual answer is that it is three or four times a year and nobody could tell you what triggers it.

. . .

1810, DAY 1.

Six of us in the pub on the highway that everybody uses and nobody would choose.

The rookie is twenty-four and it is his first digester and he has been on the winch all day. He comes because he is asked, which is the mechanism, and nobody explains the mechanism to him.

The conversation for the first twenty minutes is the route out of the site. There is a left turn at the lights that two of them consider unnecessary and one of them defends at length on the grounds of

the merge, and there is a stretch of some minutes where three people are talking about a merge with real heat and genuine interest.

Then it is a truck. Somebody's brother-in-law has bought a truck that everybody agrees is the wrong truck, and the wrongness of it is examined from about six directions, including the finance.

Then it is the pub, which has changed hands, and which everybody agrees has got worse, and which two of them can date precisely.

The rookie says, at about seven, "That was —"

And the man beside him says, "You driving?"

"Yeah."

"Right. That's you done, then." He puts a hand up for the girl behind the bar without looking away from the table. "Lime and soda for the young fella."

"I've only had the one."

"And that's the one you've had."

He gets the lime and soda, and by twenty past he is telling them about a place he worked before this one, and somebody is asking him about it properly and following up, and by half past he has forgotten that he started a sentence.

I have been on this crew four years and I have watched that happen perhaps a dozen times and I have never seen it done unkindly.

They go at eight because it is a three-day job and day two starts at six.

. . .

Day 2. 0600. Toolbox. Same nine.

0615. Atmosphere. Clean.

0620. Permit issued.

The blower intake gets a screen fitted before anybody goes near the hatch, which nobody instructed and which the millwright who cleared it yesterday brought in from the stores at half five this morning.

0630 to 1700. Grit out, mixing gear stripped, two sections of internal pipework replaced. No interruptions.

. . .

DAY 2, ABOUT ELEVEN.

The mixing gear comes out in sections and one of the sections is seized, which is what the planning meeting said would happen and which they sequenced for.

It takes four hours instead of one. The heat is the reason — you cannot use what you would normally use to free something in a space rated the way that space is rated, so it is mechanical and it is slow and it is two people taking turns on a bar.

At about one o'clock the entrant on it comes up and says the word he has been not saying for an hour, which is that he thinks it is going to need cutting, and cutting means a hot work permit on top of the entry permit, and a hot work permit in a digester is a different order of paperwork and a different set of approvals and probably a day.

Then he goes back down and it comes free at twenty past two.

He does not tell anybody it came free. The attendant logs the exit and the supervisor asks and the answer is one word, and the crew finds out at the end of the shift when the section is standing against the wall outside.

. . .

Day 3. 0600. Toolbox.

Final day is reassembly and the inspection sign-off, and it goes the way a final day goes, which is faster than planned in the morning and slower than planned in the afternoon.

1420. Last entrant out.

1430. Permit closed. Confirmed all entrants accounted for by name.

1445. Hatch secured.

. . .

She logs the exit and she asks the two questions, the second of which is about tools, and one of the four says he has left a bar in there, and it is thirty-five minutes and a fresh permit to go and get it.

Nobody complains about that either.

Then she does the thing she does at the end of one of these, which is that she goes round the four of them at the truck and says their names, one at a time, in no particular order, and each of them says something back, and that is the end of the entry.

I have watched her do it three years running and I did not notice it for the first two.

I did it myself last October on a different job with a crew I had never worked with, and it was the right thing to do and it worked, and one of them asked me afterwards where I had got it from.

The composite

Everything is flow-paced here and has been since before I started, which is the right call for a works and is not the call everywhere.

That bottle is the day. One bottle, one day, one location, and the day is over before anybody looks at it.

I am a technician. I do not run the plant. Water arrives here in bottles and leaves as numbers.

. . .

The sampler has not changed in thirty years because there is not much in it to change. Pump, timer, distributor, cold box.

The line blocks. Somebody pulls it and clears it. Four hours blocked and you have a composite that is not a composite, and the honest thing is to say so on the form and let the result be interpreted with that on it.

I have had that argument with two different supervisors. Both of them wanted the result with a caveat rather than no result. Both of them were wrong and one of them came back and said so.

I have voided samples. Not many. Voiding a sample means somebody's day of data does not exist, and there is no way to go back and get it, because the day is gone. People do not intuit that about this work: an analytical laboratory can rerun almost anything, and a sampling programme can rerun nothing at all.

. . .

CUSTODY.

Every bottle has a form and the form goes where the bottle goes.

Who took it, from where, at what time, into what container, preserved how. Who transported it. Temperature on receipt, which I record, and which has ended more arguments than any other number in this building. Who logged it in. Who ran it. Method. Instrument. When.

People find custody paperwork excessive until the first time a result is challenged, and then they find it insufficient. I have watched that happen twice and both times the person had been the loudest about the forms.

. . .

There is a temperature limit on receipt and it is not decorative.

A sample that arrived warm is a sample in which things have continued to happen. Bacteria have grown or died. Oxygen demand has been exerted in the bottle rather than in the works. Some compounds have degraded. The number you get from a warm sample is a real number about a bottle and a poor number about a plant.

So I take the temperature. I write it down. About four times a year I write down a number that is out of range, and then I make a phone call that nobody enjoys.

The conversation is always the same and it is never with a fool. Somebody's van was in traffic. Somebody's cooler had ice in it that was not enough ice. Somebody left a box on a bench for fifty minutes because a thing happened that was more urgent than a box.

"How far out?"

"Nine degrees."

"That's not — how far out is that?"

"Four is the target. There's tolerance. Nine's outside it."

"So it's no good."

"It's no good for the parameters that care. It's fine for the ones that don't."

And then we go through which is which, and about half of it survives, and the half that does not gets resampled the next day, which is a different day, which is the point.

. . .

THE SUITE.

The routine suite is the plant's own nervous system. Solids, oxygen demand in two forms, nitrogen species, phosphorus, pH, metals on a longer cycle, bacteria on the effluent side.

Those numbers go to operations and to the permit file. There is a limit against a number of them. The limits are the reason the plant is the shape it is.

Then there are the programmes.

A programme is a thing we run on somebody else's behalf, on a schedule they set, against parameters they specify, reported to them. They are not permit parameters. Nothing operational depends on them. They come out of the same bottle.

. . .

The two ends of the plant are two different analytical problems and people outside the laboratory rarely appreciate it.

Influent is a filthy matrix and interferes in ways that are specific to the instrument. Half the method development on this site is getting an interference out of the way. Dilute, digest, filter, extract, and every step is somewhere to lose what you are chasing.

Effluent inverts it. Small quantities, nothing hiding them, and the question is whether your detection limit is low enough to say anything about a number close to zero.

A permit limit that sits near a method detection limit is a permanent argument waiting to happen, and there is one of those on this site, and everybody involved is polite about it.

. . .

THE HEALTH PROGRAMME.

An aliquot out of the composite, three times a week, separate containers, own custody form, to a health authority laboratory.

Viral targets, molecular, not culture. The list changes. Things go on it and occasionally come off.

It started at scale during the pandemic and did not stop when the pandemic did. The bottle exists whether or not anybody takes an aliquot out of it, so a new programme costs a container and a form. That is why there are now several.

The results do not come back to us. I do not see them. I have no route to see them and no business seeing them; my part finishes when the courier takes the box.

What I know about the results is what anybody knows, which is that they appear in aggregate on a public dashboard some weeks later, by region, as a trend line.

. . .

THE OTHER PROGRAMME.

There is a second one and it runs on the same principle.

Same composite, acidified and frozen rather than chilled, because the targets do not survive warm and do not survive long.

Pharmaceutical and drug residues and their metabolites. Not us — a university group, under an agreement, health authority a party to it.

The list is long and I could not recite it. Prescription compounds, controlled substances, and the breakdown products of both, which are usually the better target, because a metabolite has been through a person and a parent may only have been through a drain.

That is the interesting problem on that side and it is not my side, so I hand over a frozen aliquot and a form.

. . .

There is a third programme, smaller, that runs on the solids rather than the liquid and that I mention because it is the one people have never heard of.

Some compounds do not stay in the water. They partition onto particulate matter, and if you are only analysing the liquid fraction you will under-report them by a large factor and be entirely confident about it. So there is a sampling arrangement on the sludge side for a short list of those, on a monthly cycle, for a different agency again.

That programme has existed since before I started. It generates about eleven results a month. I have never met anybody who uses them.

I assume somebody does. There is a form. There is a courier. There has been for years. The day nobody needs it any more, somebody will have to notice, and the mechanism by which anybody notices that a programme has stopped being needed is not a mechanism I have ever seen operate.

. . .

WHAT A NUMBER FROM THAT BOTTLE CAN SUPPORT.

This is the part I have opinions about and it is the part nobody asks me about.

You have a concentration. To get from a concentration to anything else you need flow. We have flow, and it is good. Then you need a population. We do not have a population, and that is the weakest link in the chain.

The population served by a works is not a census figure. It moves. It moves on a weekday against a weekend, it moves in summer, it moves when a large employer opens or closes, and the sewershed boundary is not a municipal boundary so you cannot simply add up the districts. People normalise against something — ammonia load, or a compound humans excrete at a steady rate — and every one of those normalisers has an argument against it.

Then there is what happens in the pipe. A compound entering a sewer at one end does not necessarily arrive at the other end as itself. Some degrade. Some partition onto solids and travel differently or

not at all. Residence time in a large system is hours and varies with flow, so the twenty-four hours in my bottle is not twenty-four hours of anybody's day; it is a smear across a period I cannot state precisely.

And then back-calculation, which requires an excretion factor — an assumed proportion of a dose that leaves a person as a given compound — and those factors come from studies with small numbers of participants, and they carry error bars that do not survive being multiplied by a population estimate that also carries error bars.

So: the concentration is good. I will defend the concentration. Everything after the concentration is a series of assumptions, each defensible, multiplied together.

. . .

THE QUESTION I GET.

People ask what it means, and it is not my question and I do not have the training for it, and there is an epidemiologist at the health authority whose job is precisely the thing everybody wants me to do at a barbecue.

A trend is worth more than a value. Whether the number is higher this month than last month is a comparison between two measurements made the same way with the same assumptions, and most of the error I have just described cancels. Whether the number is a particular quantity of anything is a claim I would not make and that the people who run the programme are careful not to make either.

I have read the published outputs. They are cautious. They talk about relative change. They qualify heavily. They are much less interesting than people imagine. I regard that as the programme working properly.

The one thing I will say without qualification is that it is fast. A clinical system finds out when people present. This finds out when the sample is analysed. That gap is the reason anybody funds it.

. . .

A THING I GOT WRONG.

In my fourth year I reported a set of results on a metals run that were internally consistent, passed the quality control checks, and were wrong by a factor that mattered.

The cause was a calibration standard that had been made up correctly, labelled correctly, and stored next to a similar bottle at a different concentration, and I took the wrong one, twice, on two consecutive days.

Nothing happened downstream. The results were not permit results. Nobody made a decision on them. I found it myself on the third day, when a check standard came in at a value that made no sense. I pulled the two previous days and looked at what I had done.

What I remember is the twenty minutes between working out that the results were wrong and telling somebody.

I have thought about those twenty minutes since, because I have worked with two people who did not have them — who found something and said it immediately — and both of those people were better at this job than I was at that point, and it was not because they were braver. It was that they had decided in advance what they would do and did not have to decide it in the moment.

I decided in advance, afterwards. I have not needed it since, in that form, and I have needed it in others.

The standards are now stored by concentration and not alphabetically, which is my one lasting change to this laboratory and took a memo.

. . .

ROUTINE.

Aliquot out of the composite Monday, Wednesday, Friday. Two containers. Two forms.

Acidify the second one. Log both. Into the freezer for the courier, which is Tuesday and Thursday. Friday's sits over the weekend. There is a note in the method about that. It has been there for three years.

It takes about eleven minutes.

The bottle then goes on to what it was always going to go on to, which is the routine suite, and the routine suite is what my morning is actually about, and the eleven minutes are eleven minutes.

. . .

THE CERTIFICATE.

The instrument on the nitrogen bench has a calibration certificate in the folder, signed, current, dated in March, issued by the service house.

The instrument in that position was replaced in 2021.

The certificate refers to the old one by serial. The service engineer who signed it did the work on the new one — he was here, I let him in, I watched him do it — and then produced a certificate carrying a serial number that has not been in this building for five years.

I raised it with the service house. They are sending a corrected certificate. That was in April.

The folder currently contains a document that is signed, current, correct in every particular except the identity of the instrument it describes, and an instrument that is calibrated and performing and has no certificate that names it.

Both facts have been true at once since March and the bench has run continuously throughout.

. . .

HIM.

The All-Seeing comes to the laboratory perhaps twice a week and stands at the end of the bench where the composites are logged in and does not touch anything.

He looks at the bottles.

That is all he does. He does not ask for the log, which he could have, and he does not ask for results, which he could also have and which would be quicker. He stands and looks at a row of amber bottles in a rack for as long as it takes to drink a coffee.

On the Tuesday he said the influent solids would be up around a certain figure.

The suite ran at eleven and the figure was that.

I put the eleven o'clock in the system because the eleven o'clock is the analysis. There is no field in a laboratory information system for a thing somebody said at a quarter past eight, and if there were I would object to it, because the value of every number in that system is that a person can trace where it came from.

He does not ask afterwards. I have never once had him ask me what a result was.

. . .

THE CHAIR THING.

There is a version of the chair thing here too and it happens at that end of the bench.

I told him, in February, about a method validation I did in my second year on a parameter we no longer report, which took me four months, which was correct, and which was superseded eighteen months later by a different method that was better. The work was good. It is in a file. Nobody has opened the file.

He asked which matrix.

I said final effluent.

He asked what the recovery had been. I told him, and he did not say anything to that at all, and then he took his coffee cup out, because you cannot have a cup on that bench, and I went back to the racks.

I have no account of why I told him and I have told nobody else, including two people who would have understood the method better than he did.

. . .

THE ELEVEN-MINUTE PROBLEM.

There is a slow argument in this building about the programmes and it is not about the programmes.

Every one of them is close to free at the margin and none of them is free. Eleven minutes for the health aliquots. Twenty for the monthly solids. An hour a month reconciling forms. Freezer space, which is finite and which has been at capacity twice. And the courier arrangement, which is a real line in somebody's budget.

Against that, none of them is a permit parameter, so if the laboratory is short-staffed on a Wednesday, the thing that gives is never the permit suite, because the permit suite is the licence to operate.

So the programmes are always the first thing at risk and never the first thing cut. They have survived every staffing squeeze I have been here for. The reason is that a technician does them on a short Wednesday, and nobody records that as a decision.

I have done it. It goes in as ordinary time.

. . .

END OF THE DAY.

Sixty-one samples logged. Forty-three results out. Two reruns, one of which was mine and one of which was the instrument.

Three aliquots to the freezer.

The composite from Monday is now a set of numbers in a system, and a bottle in a rack that will be held for its retention period and then disposed of. The day it represents is nine days ago. Nobody will look at that bottle again.

I am careful about what I say a result means, because the method says what it can support, and because the number is a measurement of what was in a bottle.

That is not modesty. It is the actual limit of the technique, and everybody who works with these numbers professionally knows exactly where that limit is, and the people who get into trouble with them are the ones who do not.

PART SIX

OUTFALL AND PERMIT

What leaves

Whoever has this file next will inherit the quarterly, so: it is at nine, it runs to eleven, and it has never once run to eleven.

Eleven people in a room built for eight. Operations, laboratory, environmental monitoring, the process side, somebody from asset management who attends for one item and stays, a person from communications who attends because of a decision taken in 2021, two of us from permitting, and a phone in the middle of the table with a consultant on it who will say four things in two hours and all four will be worth hearing.

You will chair it. Chairing it means owning an agenda that has grown by accretion since before I had the file, and that I have twice tried to reduce and twice failed to. Do not try in your first year. It reads as tidying and it is read as tidying.

The agenda is: results for the quarter, exceedances, monitoring programme status, receiving environment, upcoming amendments, and any other business, which is where the meeting actually happens.

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RESULTS.

Twelve months of effluent data on a screen and a set of limits beside them.

A discharge permit does not say *be clean*. It says a list of parameters and a number against each, and for most of them a maximum and an average, and the averages are the ones that matter operationally because a plant can have a bad day and cannot have a bad month.

Solids. Oxygen demand. pH range. Residual chlorine, where it applies. A set of monitoring-only parameters that carry no limit and are reported anyway, and which exist because at some point

somebody wanted to know and wrote it into a permit and it has been reported every month since.

The results are fine. The results are almost always fine, which is a sentence I have to be careful with in this room, because the reason they are fine is that about four hundred people spend their working lives making them fine and a permit officer saying *the results are fine* in a flat voice has, on one occasion, been taken the wrong way by somebody who had been up all night in February.

So I say what the numbers are and I say who did it, and the second half takes longer than the first.

. . .

WHO IS IN THE ROOM.

Somebody asked me in my first year why a compliance meeting needs eleven people and the honest answer is that it needs about six and has eleven for reasons that are individually sound.

Operations are there because they run it. Laboratory are there because they produce every number under discussion and because a discussion of results without the analyst present is a discussion of somebody's work in their absence. Environmental monitoring are there for the receiving environment item and stay for the rest, which is correct, because the receiving environment is what the rest is about.

Process are there because half of what causes a number to move is a process decision made three weeks earlier.

Asset management attend for the corrective actions item, which is item two, and then stay for ninety minutes with nothing to contribute, and I have twice offered to move their item to the end so they can leave, and both times they have declined, and I have never worked out whether that is diligence or a preference for a room with other people in it.

Communications attend because of 2021, which was a weekend, and a photograph, and a media call that came to somebody who did not have the numbers, and after which a decision was taken that somebody from that section would be in this room every quarter. It

has never once been needed since. It will be needed eventually and that is the point of it.

And the two of us from permitting, because it is our document.

. . .

THE EXCEEDANCES.

Two in twelve months.

Both were reported inside the notification window. Both were investigated. Both had a cause identified. Neither did anything to the receiving environment that anybody has been able to detect and both were, in the language of the file, non-compliances.

That is the correct word and I use it and I will keep using it. There is a strong pull in a room like that towards *events* or *excursions* or *deviations*, and every one of those is a word chosen to sit more comfortably, and the permit says non-compliance and so do I.

We are on the third discussion of one of them, because the corrective action had a completion date and the completion date has moved twice.

“Where’s that at?”

“It’s with capital.”

“It was with capital in March.”

“It’s still with capital.”

“Is it the same person at capital?”

A pause. “No.”

That is the problem with the second exceedance and everybody in the room understands it inside four seconds, and it will be resolved eventually because the corrective action has a regulator-visible date on it and a regulator-visible date is the only kind that moves things through a capital programme.

. . .

THE RECEIVING ENVIRONMENT.

The item nobody outside this section expects is the monitoring programme, which is not about the effluent at all.

There is a set of surveys in the receiving water on a multi-year cycle. Sediment chemistry at stations on a grid. Benthic community structure, which means somebody takes a grab of river bottom and somebody else sorts and identifies what is living in it, to a level of taxonomic detail that would surprise you. Tissue analysis on a small number of species. Water column work.

That is the actual test. The permit numbers are a proxy; the survey is the thing the proxy stands for.

It is expensive, it is slow, it produces a report every few years that runs to several hundred pages, and it is read in this building by about five people.

The consultant on the phone runs it, and this quarter she said one of her four things.

“Station eleven’s changed.”

“Changed how?”

“Community composition. Not abundance. Composition.”

“Is that us?”

“Almost certainly not. There’s a marina gone in upstream and the substrate’s different.”

“Almost certainly.”

“I’m not going to say certainly on one survey.”

That is a completely straight answer from somebody who is paid by us and who would find her life easier if she said *no*, and everybody in the room registered it as such and nobody said so.

Station eleven goes on the next cycle with two additional stations either side of it, at our cost, at her recommendation, and there was no discussion.

. . .

THE LIMIT NOBODY CAN DATE.

There is one parameter in our permit with a limit that is stricter than anything the receiving environment requires and stricter than the same parameter at three comparable plants in this province.

It has been that way since a renewal in the mid-nineties.

I have three accounts of why, from three people, and they do not agree.

The first is that it came out of a negotiation in which the organization traded that limit to get flexibility on something else that mattered more at the time, and that the something else has since been superseded by a regulation, so the price was paid for a thing that no longer exists.

The second is that it was a drafting artifact — that a number was carried across from a different section of a model permit and nobody caught it, and that by the time anybody noticed it had been complied with for four years, which makes it very hard to argue you cannot comply with it.

The third, which comes from the person who was actually in the room, is that it was neither of those and was a deliberate decision taken on the advice of somebody's consultant on grounds that were defensible at the time and would not be now.

All three of those people are certain. Two of them are certain in writing.

The plant complies with it and has always complied with it and the compliance costs something, and about every three years somebody proposes seeking a relaxation at the next renewal, and every time the proposal gets as far as a risk assessment, and every time the risk assessment says the same thing, which is that opening a permit is opening a permit.

"You open it for one line, they can look at all of it."

"They can look at all of it anyway."

"They can. They don't."

The person who said that second thing is the most senior person in the room and has been doing this for thirty years and it is, comfortably, the best sentence said in that meeting or in the previous four.

Nobody proposed a relaxation this quarter either.

. . .

AMENDMENTS.

Item five is upcoming amendments and item five is where the meeting gets slow.

An amendment is any change to what the permit says, and every one of them is an application, and every application is a submission with a technical basis and a rationale and a period during which somebody else looks at it.

There are three on the go. One is administrative and has been on the go for eleven months. One is a monitoring frequency change that everybody agrees with including the regulator and that requires a piece of modelling that nobody has been resourced to do. And one is a genuine change of substance connected to the construction programme, which is the important one, and which is on track.

The administrative one generates the discussion, because it is a change of a name.

“Still with them?”

“Still with them.”

“Have we chased?”

“I chased on Thursday.”

“Then that’s three.”

There is a version of this organization in which somebody would be angry about eleven months for a name change. I have worked in that version elsewhere and the anger did not make anything faster. The regulator has four people and a queue, and our name change is behind things that matter more, and I would put it behind those things too.

. . .

TWO ENTITIES, ONE PERMIT.

Here is a thing that took me eighteen months to be able to explain to a new colleague without a diagram.

The permit is held by one legal entity. The plant is operated by staff employed under the umbrella of an organization that is administratively the same and legally is not. The obligations in that document sit with the holder. The people who can actually cause those obligations to be met are on a different piece of paper.

Nothing goes wrong because of it. The same people sit on both sides, the arrangement has run for decades, and it surfaces perhaps twice a year in a way that takes an afternoon — a signature block, whose insurance, and once a form with a field for the operator's name that would not accept two names and would not accept a blank.

There is a memo from 2014 that describes the position accurately and recommends no action. I have read it four times, I agree with it every time, and it still makes me slightly uneasy on a Tuesday.

. . .

LOAD.

There is a distinction in that permit that almost nobody outside the field understands and that governs a substantial amount of what this organization does.

A concentration limit says how strong the effluent may be. A load limit says how much of a substance may be discharged over a period, which is concentration multiplied by flow.

Those are not the same instrument and they behave in opposite directions when it rains.

Under a concentration limit, rain helps you. More water through the plant, same mass of material, lower concentration. Under a load limit, rain does nothing for you at all, because the mass is the mass.

We have both, on different parameters, for good reasons in each case, and the consequence is that a wet month is comfortable on one page of the report and unchanged on the next, and somebody

reading only the first page would form an entirely wrong impression of how the plant had performed.

A briefing note once went three levels up with only the first page in it. The person who wrote it was not being careless; they had been asked for a summary and had summarized.

. . .

THE OUTFALL.

The physical end of all this is a tunnel.

The new one is a deep bore under the river with shafts at each end, and at the wet end it comes up into a riser and out through a diffuser — a manifold with ports along it, sized and spaced and angled so that what leaves does so in a way that mixes.

That is the design intent and it is worth saying plainly: the outfall is not a pipe that discharges, it is a machine for mixing. The ports are the machine. The velocity out of each port, the spacing, the depth, the angle, and the current at that point in the river are the parameters, and they are modelled, and the model produces an initial dilution figure, and that figure is the basis on which the limits in the permit were set.

Which means the permit numbers and the diffuser geometry are the same document written in two languages.

I asked the engineer on that project, once, whether anybody had ever seen it working.

“Seen it how?”

“Seen it. Down there.”

“There’s survey. There’s dye work. There’s the modelling.”

“But nobody’s looked at it.”

“There’s nothing to look at. It’s water in water.”

He was not being dismissive. He thought about it for a while afterwards and came back to it in a corridor two weeks later to say that a diver had been down on the structural inspection, and had reported on the structure, and had not been asked about the mixing, because the mixing is not a thing a diver can report on.

. . .

THE DISCHARGE.

The Allfather signs the operational side of what leaves and has for as long as this permit has existed. Not the permit — the operating authorities under it, of which there are perhaps forty, and his name is at the foot of every one, under paragraphs drafted by people in three different sections across two decades. He has never sent one back.

There is a rate. It is not fixed — the plant discharges what it treats and the flow is what arrives — but there are decisions inside that about how a change is made, and when, and over what period, and those decisions are his.

The one I sat in on was a planned change during a maintenance window when a portion of the works was out and the effluent quality would move within limits but visibly.

The environmental monitoring lead wanted a ramp. Her reasoning was the receiving water and the monitoring programme: a step change gives you a data set that is hard to interpret afterwards.

The operations position was that a ramp costs you window.

He gave a rate and a duration, immediately, in the way you give somebody the time.

The monitoring lead asked what it was based on and he said the state of the river, and she said which part of it, and he told her, and she wrote it down and did not ask anything else, and afterwards she told me it was the answer she would have given if she had had three days.

The change ran that night. The data set is clean. Nobody adjusted anything at any point during it, which the operations log records by not recording anything.

. . .

THE OTHER THING THAT HAPPENS IN THAT MEETING.

Any other business is where people bring things they have been carrying.

This quarter it was a man from the process side who has been here twenty-six years and who wanted to talk about a parameter that came off our permit in 2009.

Not a complaint. Not a proposal to put it back. He had found something in an old file while looking for something else and he wanted to describe how that parameter had been managed in the nineties, which involved a set of manual practices that no longer exist and a piece of equipment that was decommissioned before half the room was hired.

It took six minutes. There was no action arising and everybody knew there would be no action arising by about the second minute.

The Allfather listened to it, and at the end asked which building the equipment had been in.

The man said the number.

The Allfather nodded at that and said the meeting was at time.

. . .

THE THING I AM FOR.

A new colleague asked me last year what a permit officer actually does, and I gave her the list — applications, amendments, reporting, liaison, the annual return — and she said that sounded like administration, and I said it was, and then thought about it for a week.

What I would say now is that nobody in this building is trying to breach that permit, and that the risk was never malice. It is that a document written in 1996 and amended nine times sits behind a plant that has been rebuilt around it, and that the number of people who know why any particular line says what it says decreases by about one person every two years.

So: the reporting, and also being in a room where a decision is being taken and saying which line it touches.

The metrics the section is reviewed on are submissions filed on time and exceedances reported inside the window. Both are at a hundred per cent.

The three accounts of the undateable limit are in the file under my initials, all three, with the names against them. Two of those people will have retired before you read this. Do not reconcile them. Keep all three.

. . .

TIME.

The meeting is at time and there are two items left.

There are always two items left. The agenda has had six items and two hours for four years and has never once got past four, and the two that get deferred are always the last two, and the last two are always the ones with a longer horizon, because the ones with a longer horizon are the ones that do not have a date on them.

So the permit renewal preparation — which is the largest single piece of work this section will do in the next three years and which needs to start about now — has been the fifth item on that agenda for four consecutive quarters.

“Do we want to carry those?”

“We’ve carried them.”

“We’ve carried them four times.”

“We’ve got the room till eleven.”

And then somebody from a different section opens the door, because they have the room from eleven, and stands there with a laptop and the expression of a person who is not going to say anything and is definitely not going to leave.

I carry the items.

The renewal preparation item now has a note against it in the minutes that reads *carried forward* (4), and the reason the number is in there is that I put it in there eighteen months ago as a small piece of pressure, and it has gone from (1) to (4) and has changed nothing at all, and I intend to keep counting.

Still running

2214.

“Night.”

“Night. Anything?”

“Number three’s noisy.”

“Noisy how?”

“Noisy like it’s been noisy for a year.”

“Right.”

Handover is four minutes on nights and that is generous.

. . .

This is a primary plant and there are not many of us left.

Primary treatment is settling. What arrives is screened, the grit is taken out, and then it goes into large tanks and sits, and the heavy fraction goes to the bottom and the light fraction comes to the top and both are removed, and what is left in the middle goes to the outfall.

That is it. There is no biology. There is no aeration, no return sludge, no clarifier in the sense the secondary plants mean, no population being kept alive at a rate. There is gravity and there is time.

It removes a substantial proportion of the solids and a smaller proportion of the oxygen demand and it does not touch a range of things that a secondary plant does. That is the point, and it is why this facility is being replaced, and it is why the federal regulation says what it says.

Two of these left on this coast. This one and the other one, and the other one is being rebuilt too.

I have worked here nineteen years.

. . .

2255.

Four of us on site.

The plant does not need more than that at night and would not be safer with more. What it needs is that the four know it, and three of the four have been here over a decade.

Rounds twice a shift, and the log every two hours, and the gate as required, and everything else is what turns up, which on most nights is nothing and on the other nights is the reason there are four of us.

There is a control room and it is not a control room in the sense that a modern plant has one. It is a room with screens in it that were installed at three different times and do not share a philosophy, and a printer, and a chair that everybody complains about and nobody replaces because the plant closes in 2030.

That is a sentence that gets said about most things here. The chair. The kettle. The heater in the workshop that has one setting.

It closes in 2030.

It has been said about the heater since 2019, when the closing date was 2025.

. . .

2340.

“Cap on four’s tripped.”

“Reset it.”

“Reset it twice.”

“Then leave it and write it up.”

That is most of a night shift here. There are four of us on site and one of us is on the gate, and the plant runs, and things trip, and you reset them or you write them up.

The equipment is old, and old here does not mean neglected, and it does not mean unsafe, and it means what it means everywhere else in this industry, which is that a thing has been maintained for longer than it was designed to be maintained for. That is not a complaint

and it is not neglect: this facility has been scheduled for replacement for long enough that the capital position on it is entirely rational, which is that you keep it running safely and you do not invest in a plant with a closing date.

Every operator here understands that. It still means you are running a plant on parts.

. . .

0035.

What primary treatment does not do is the part that people get wrong when they get it wrong in our favour.

We take out solids and we take out some of the oxygen demand. We do not take out dissolved material. We do not take out nutrients in any meaningful way. We do not remove the range of things a biological process removes, because there is no biological process.

The effluent is disinfected and it goes out through an outfall into deep water with a diffuser on it and the dilution there is very large, and that combination — deep water, strong current, high dilution — is the reason a primary plant was considered adequate for a long time, and the reason people argued about it for thirty years.

I am not going to relitigate that argument at half past midnight. The federal regulation says secondary as a minimum and the regulation is the answer and the plant is being built.

What I would say, and what everybody who has worked in one of these says, is that primary treatment is not a failure of a plant. It is a plant doing precisely what it was designed and permitted to do, at the standard of its time, for sixty years, without missing a day.

. . .

0110.

The new plant is about four kilometres away and there is a webcam.

Somebody put the link in the lunchroom on the shared screen about three years ago as a joke and it has never been taken down

and it is still there, on the wall, at half past one in the morning, showing an empty construction site with lights on it.

The numbers have been in the paper often enough that people here can quote them. Seven hundred million at the start. Three point eight six billion now. A contractor removed from the job. Litigation that settled in the middle of last year. An independent review reporting early next year. Completion targeted 2030.

The lunchroom position on all of that is not what an outsider would expect.

Nobody here is angry about the money. What people here say, when it comes up, is some version of: it was always going to be hard.

There is a man on days who has been at this longer than I have and who says the same thing every time, which is that they are building a tertiary plant on a hill in a city, on a site the size of a parking lot, with sea level rise in the design brief, next to a bridge, while a hundred thousand people go past.

“Course it’s late.”

“It’s a lot of money.”

“It’s a lot of plant.”

That is the exchange. It happens about once a month and it is always the same two men and it is always identical.

. . .

0140.

The other thing on the channel at night is other people’s plants.

Five of them on the regional side and the frequency carries traffic from all of them if you have the scan on, which most of us do, because at three in the morning it is company.

You learn their rhythms. The big one on the river is busy all night and always has been. The one on the island is chatty. There is a plant where two operators have a running disagreement about something I have never identified and have listened to twice a week for four years.

You get to know voices without ever meeting anybody. There is a woman on nights at one of the secondary plants whose voice I would

recognize anywhere and whose name I do not know and who I have never spoken to, because there has never been a reason.

When this place closes I will lose that. Nobody has ever mentioned it as a cost of anything and it is not one.

. . .

0205.

The lunchroom has the webcam on one wall and a framed photograph of the plant from the air in about 1970 on the other, with fewer buildings on it and no bridge in the corner.

The photograph is the one visitors look at. It is a good photograph and the site is recognizable and about a third of it is not there any more.

I have seen two people take a picture of that photograph with a phone. Both of them were leaving.

. . .

0225.

"There's a truck at the gate."

"Booked?"

"Says he's booked."

"Is he booked?"

"He's booked."

. . .

0250.

What people want to talk about here is not the money and is not the plant.

It is what happens to us.

The new facility has a different process and needs a different certification, and there is a training programme, and it is real and

it is funded and it started early, which is more than has happened at some places I have heard about. People are being put through. There is a plan.

The plan has a shape. Some people go across and are trained and end up in a plant with more instrumentation than this building has fittings. Some people go to other sites in the region. Some people are within a few years of a pension and will not be here when it opens, which is a fact and not a grievance and is discussed openly and without bitterness at that table.

And there is a category of person for whom none of the above quite works, and there are about four of those, and the organization is dealing with them individually, and I have not heard anybody say they have been dealt with badly.

What nobody has an answer for is the other thing.

I know this plant. I know what number three sounds like when it is noisy in the way it has been noisy for a year, and I know which of the tanks pulls to one side in a north wind, and I know that if the level in a particular chamber comes up faster than a particular rate then it is not the flow, it is a valve, and I know that because it happened in 2011 and I was on.

None of that is going anywhere. It is not a transferable skill. It is knowledge of a specific building that is going to be demolished.

The new plant will take a decade to develop its own version of that, in people who are not yet hired, and there is no mechanism by which any of what is in my head gets into theirs, and everybody involved knows it, and the training programme cannot address it because it is not training.

That is not a criticism of anybody. I have never heard a proposal for how it would be done.

. . .

0335.

The Companion is on nights this rotation.

She is not an operator here. She has come across from another site on a rotation that exists because this plant is short and will get

shorter, and she has done four months of a twelve-month posting, and at the end of it she will go somewhere else.

What she does is the work. The rounds, the resets, the log, the gate, the same as the rest of us.

What is different is that she does the rounds with people.

That is not a policy. Rounds here are a single-operator task and have been forever and there is no requirement for two. She goes with whoever is on, and she goes at whatever point in the shift that person does theirs, and she has done it since her first week and nobody asked her to and nobody has ever remarked on it in my hearing.

Four months in, three of the four of us have started doing our rounds at the same time as somebody else.

Tonight she is with me because it is my rounds and it is twenty to four.

Nothing is said between the header house and the tanks, which is about six minutes, and nothing needs to be. There is a point on that walk where you come round the corner of the building and the inlet is in front of you and the lights are on it, and I have walked past it perhaps eleven thousand times.

At the tanks she reads the level and I write it down. Then I read one and she writes it down. That is not the procedure. The procedure is that one person does both.

We have done it that way since about her third week and I could not tell you which of us started it.

. . .

0350.

We do the rounds and at the far end there is the outfall chamber, which is where what leaves goes to leave.

You do not see anything. It is a chamber with a level in it and a flow reading and a hatch, and beyond it is pipe and then it is the inlet and then it is not ours. There is nothing to look at and no reason to stop there.

I stop there. I have always stopped there. Not for long — twenty seconds, on a round that takes fifty minutes — and I could not tell you what for.

She stopped there too, the first time she came round with me, and has every time since, and neither of us has ever said anything about it. I do not know whether she stops because I do or whether she would anyway.

. . .

0412.

The variance comes up on the sheet.

We had a small spill in the yard on the afternoon shift — a coupling on a transfer line, contained inside the bund, no release, twenty minutes to stop and about two hours to clean up. It was reported and it is written up and the report has a volume in it.

The volume released was estimated from the pump rate and the duration. The volume recovered was measured out of the bund.

Recovered is higher than released. By about nine per cent.

That happens. Rainwater in the bund, residual from a previous wash-down, the estimate being an estimate. The afternoon supervisor has noted it and has written *recovered volume exceeds estimated release; estimate low* and has moved on, which is exactly right.

It goes in the log and it goes on the report and nobody will ever look at it again.

. . .

0440.

The sludge here goes off site.

There is no digester on this plant. What settles is thickened and it goes out by truck to another facility for processing, which is a road movement, every day, for sixty years, and which is one of the reasons the replacement is being built with a different arrangement.

The night driver has been on that run eleven years and comes in at about quarter to five and has a cup of tea in the lunchroom while his truck loads, and he is the fifth person on site for about twenty minutes and everybody counts him as one of us.

“Cold.”

“It’s cold.”

“They fix that heater?”

“It closes in 2030.”

“Right.”

He has heard that answer for six years and asks the question every winter.

. . .

0520.

“Number three.”

“What now?”

“Same.”

“Write it up.”

“I did write it up.”

“Write it up again.”

. . .

0525.

“Do you think you’ll go across?”

That is her, at the table, at twenty-five past five, which is the hour on a night shift when people ask things.

“To the new one?”

“Yeah.”

“I’m fifty-four.”

“That’s not an answer.”

“It’s most of one.”

She waits, which she does, and after a while I say the actual answer, which is that I do not know, and that the training would

take two years, and that at the end of two years I would be a junior operator on a plant with a process I have never run, in a building I do not know, and that there is a version of that which is a good end to a career and a version which is not, and I cannot tell from here which one it would be.

“What would decide it?”

“Who else went.”

She thinks about that and says that is the answer most people give her, and I ask how many people she has asked, and she says everybody.

. . .

0610.

There is a thing on the channel at about ten past six that I only notice because it is quiet and I have nothing else to do.

Two items, one after the other, from the regional side, on the shared frequency that carries everything.

The first is a scheduled valve exercise on a transmission main, completed, no issues, out of service window closed early.

The second is a notification about a chamber inspection on a crossing, which is a thing built some years ago that goes under water and that I have never seen and that nobody I know has any opinion about at all.

Both of those take about eleven seconds each and then the channel is quiet again and the webcam on the lunchroom wall is showing lights on an empty site four kilometres away.

. . .

0645.

Handover.

“Night.”

“Morning. Anything?”

“Number three’s noisy.”

“Noisy how?”

“Noisy like it’s been noisy for a year.”

“Right.”

I do the log, and I sign it, and I put it on the desk where the log goes, and the day shift starts filling the kettle before I am out of the door.

The plant is running. It was running when I got here at ten and it is running now and it will be running at ten tonight when somebody else comes in and asks what number three is doing.

Out at ten past seven. Traffic on the bridge is already backed up.